

IOWA HIGHWAY RESEARCH BOARD (IHRB)

Minutes of June 30, 2006

Regular Board Members Present

A. Abu-Hawash
J. Alleman
R. Ettema
T. Fonkert

L. Jesse
M. Nahra
R. Schletzbaum

Alternate Board Members Present

J. Berger for John Adam
R. Younie for S. Dockstader
R. Fosse for Jeff Krist
S. Gannon for Clark Schloz

Board Members with No Representation

Lyle Brehm
Jon Ites
John Joiner
J. Rasmussen

Secretary - M. Dunn

Visitors

Edward Engle
Deanna Maifield
Mary Starr

Iowa Department of Transportation
Iowa Department of Transportation
Iowa Department of Transportation

J. Alleman
J. Cable
Halil Ceylan
Duane Smith
Russ Walters

Iowa State University/CCEE
Iowa State University/CCEE
Iowa State University/CCEE/CTRE
Iowa State University/CTRE
Iowa State University

Greg Carmichael
David Lee
Connie Mutel
Mohamed Elhakeem

The University of Iowa
The University of Iowa
The University of Iowa/IIHR
The University of Iowa/IIHR

Wade Greiman
Steve Klocke

Snyder & Associates
Snyder & Associates

The meeting was held at The University of Iowa's Hydraulics Laboratory located at 300 South Riverside Drive, Iowa City, Iowa. The meeting was called to order at 9:00 a.m. by Rob Ettema acting as Chairperson with a total of 11 voting members/alternates at the table.

Agenda review/modification

- An RFP solicitation within Item 9 on the Agenda (Review/Finalize RFPs for 1st Solicitation for FY 2006-2007) titled *Review of Inconsistencies Between SUDAS and Iowa DOT Specifications – Phase II* was moved to Item 6 to follow the presentation of Final Report for TR-524, "Review of Inconsistencies Between SUDAS and Iowa DOT Specifications – Phase I". Agenda items followed sequentially thereafter.
- Two presentations on the research activities at The University of Iowa were added at the end of the meeting during the business lunch.

Approval of the minutes

- Motion by Larry Jesse to approve the minutes from the April 28, 2006 meeting. 2nd by Rick Fosse.
Carried 11 yea, 0 nay, 0 abstaining.

The University of Iowa Welcome

Dr. Gregory Carmichael, Associate Dean of Graduate Programs & Research and Professor of Civil and Environmental Engineering welcomed the Iowa Highway Research Board and guests.

FINAL REPORTS

Final Report TR-466, "Evaluation of Unbonded Ultrathin Whitetopping of Brick Streets", presented by Dr. Jim Cable, Iowa State University/CTRE, (\$47,049)

Purpose - Two projects were studied in which a PCC overlay was applied to a base of asphaltic cement concrete and brick, one in Oskaloosa and one in Des Moines, Iowa.

Scope - The Oskaloosa project consisted of a PCC overlay of two city blocks. The original brick street was built in 1899. A 3" lift of hot mix asphalt was placed over the deteriorated bricks in 1960. The existing asphalt overlay was first removed from the bricks by milling and air blasting. Then the existing curb and gutter were removed and replaced in a raised position to allow 4" of concrete to be placed on top of existing brick. Concrete, some mixed with polyfibers, was placed in half-roadway widths in different phases over the next 10 days. Joints were then cut with a dry saw 3/8 inches wide to a depth of T/3. The Iowa DOT's falling weight deflectometer (FWD) was used for deflection testing and to determine the support value of the existing surface.

The Des Moines project consisted of a 2 block stretch of roadway that serves as a heavy truck connection between a portion of I-235 and grain-processing facilities. The existing pavement consisted of a 4-6 inch deep asphalt layer over a single layer of brick standing on edge. All asphalt was removed prior to adding the new overlay and the specifications for this project were patterned after the Oskaloosa project. Two cores were taken at random locations after the concrete was placed to review the bond between the two pavement materials. The project was also reviewed for pavement distress immediately after opening to traffic and again roughly 20 months later.

Conclusions -

- The Oskaloosa and Des Moines projects have shown that ultrathin PCC overlays of brick streets are feasible and perform well under heavy truck route conditions.
- Conventional mixes with the addition of polyfibers can be used to ensure the performance of the 3-4.5 inch deep overlay sections.
- The deflection (FWD) data for the Oskaloosa project indicate good load transfer in all test locations, slab sizes, and testing periods.
- The Des Moines' project pavement overlay is performing well for the type of traffic it is serving. Ultrathin PCC overlays can be placed very quickly with minimal closure and traffic delay.
- In areas where asphalt overlays have failed in the past due to the overlay material's flexibility, ultrathin PCC overlays are a better alternative.

Motion to Approve

Motion by Todd Fonkert, 2nd by Mark Nahra.
Motion carried with 11 aye, 0 nay, 0 abstaining.

Final Report TR-514, “Development of a Manual of Practice for Roadway Maintenance Workers” by Duane Smith, Iowa State University/CTRE, (\$64,991)

Purpose - The purpose of this project was to create an easy-to-understand manual outlining proficiency and safety techniques for maintenance workers. This report is the conclusion of successful research with every chapter & item the result of careful review by a Steering Committee during development.

The report lists guidelines for maintenance workers on public, private, rural and urban roads. The manual should be used in addition to individual county policies and procedures.

Scope - This manual presents best roadway maintenance practices for Iowa’s local roads and streets, from the center line to shoulders, ditches and drainage. Included are chapters on public relations, bridge maintenance and snow and ice control. Each chapter contains safety tips and appropriate information on managing quality control as well as a list of references for further information.

Conclusions – There are many very successful procedures and techniques being used to enhance proficiency and safety techniques for maintenance workers in use by individuals and various departments and agencies. This manual successfully brings many of those techniques together into one easy-to-read format with graphics and images, charts and chapter outlines for quick reference.

Discussion - A future proposal may be presented to take the information gained through this project to produce easy-to-read pocket guides.

Q: How will we get copies?

A: We will do initial distribution to major towns and cities. There will be 300 printed.

C: These are a little different than our normal distribution; normally, we just electronically distribute them.

Q: Will there be a pdf file that can be used to print from?

A: Yes, it will be put on the website. A few changes will be made to accommodate the electronic format.

Q: You said you didn’t go into a lot of research on bridge maintenance, can you elaborate on what people were looking for there?

A: When you look at bonded surfaces for example, we just looked at how to find out where the areas are that are de-laminated, what products are available. We didn’t talk much about the channel or how to clean out scour. It was more about what to look for as you go through routine maintenance operation such as bridge washing and mowing around guard rail when mowing.

Motion to Approve

Motion by Rick Fosse 2nd by Roger Schletzbaum.

Motion carried with 11 aye, 0 nay, 0 abstaining.

Final Report TR-524, “Review of Inconsistencies Between SUDAS & Iowa DOT Specifications – Phase I”, Wade Greiman, Snyder & Associates, (\$154,481)

Purpose – The Iowa DOT administers Federal Aid and Primary Roadway projects utilizing Iowa DOT Specifications for Rural Construction and Highways. Federal Aid & Primary Roadway Projects are increasing in urban areas and require special considerations for projects dealing with storm sewers, sanitary sewers, water mains, sidewalks and traffic signals.

SUDAS Specifications are developed by cities statewide and intended for urban construction; currently used by over 100 local governments across the State. A solution to finding common specifications and inconsistencies between SUDAS and Iowa DOT projects was necessary. TR-524 is the result of that investigation, providing cross-references to detect related specifications.

Scope – To identify inconsistencies in 6 areas:

- Cross References
- Defined Terms
- Bid Items
- Measurement & Payment
- Construction Methods
- Plans and Figures

Conclusions

- Significant differences were identified
- Beneficial to take advantage of each other’s strengths
- Cooperation and compromise brings results
- Iowa DOT tentatively accepts utilization of SUDAS specifications for selected sections storm sewer, sanitary sewer, water mains and traffic signals

Motion to Approve

Motion by Bob Younie 2nd by Mark Nahra.

Motion carried with 11 aye, 0 nay, 0 abstaining.

Proposal Update – TR-524 Phase II

Review of Inconsistencies between SUDAS and Iowa DOT Specifications IHRB 06-01

Future work will include Iowa DOT acceptance and utilization of SUDAS for selected sections including storm sewers, sanitary sewers, water mains and traffic signals by September 2007. The proposed Phase II Project would involve updating SUDAS specifications for:

- Sanitary Sewer (including trenches)
- Storm Sewer (including trenches)
- Water Main (including trenches)
- Traffic Signals
- Driveways, Sidewalks & Recreational Trails
- Revise SUDAS figures (112 total)
- Utilized by both Iowa DOT & SUDAS

Recommendation by Mark Dunn to request Proposal from Snyder & Associates rather than proceed with widely distributed RFP.

C: It's reasonable to push this along until we have a resolution in place.

Q: Will we need to coincide with that September 2007 date?

Q: I (Mark Dunn) assume (to Wade Greiman) that you are projecting completion by September 2007?

A: Yes, September 2007 is the completion date for Phase II.

C: We have to print the book in July/2008; it needs approval by the Specification Committee 10/2007.

Mark: If the Board chooses to do that we'll work with Snyder & Associates to get a work plan developed with the objectives we want.

Motion to Approve

Motion to direct Research & Technology to work with Snyder & Associates to prepare a proposal to accomplish the IHRB 06-01 Problem Statement by Mark Nahra. 2nd by Larry Jesse.

Motion carried with 11 aye, 0 nay, 0 abstaining.

Final Report TR-538, "Using Scanning Lasers for Real-Time Pavement Thickness Measurement", R. Walters, Iowa State University/CTRE, (\$100,000)

Purpose - Estimating pavement thickness is essential to assure quality; yield quantities are monitored and core samples taken every 2,000 square yards. Taking concrete cores is labor intensive, destructive and sampling density is limited in addition to the fact that contractor payment is based on estimated thickness.

With the reduced need for coring and need to perform pavement depth checks during paving operation, the sampling coverage will be better and produce a cost savings to contractor and owners.

Scope

- Investigate/test new methods for an in-process approach to determine concrete pavement thickness
- Reduce the need to take cores and provide spot depth checks during the paving operation
- Evaluate various NDE methods using scanning lasers, eddy currents and ultrasound

NDE techniques with greatest potential

- Laser Scanning
- Ultrasound
- Eddy Current Sensing

Other NDE techniques

- Ground Penetrating Radar
- Echo Impact
- Radar
- Stereo Vision

Conclusions & Recommendations

- Two viable NDE approaches
 - Laser scanning
 - Full data coverage – Determine thickness at any location
 - Accuracy in line with that of the core sample
 - Needs coordinate control to align subbase and pavement scans
 - Eddy current sensing
 - Concrete is invisible to the sensor
 - Detects depth conductive material
 - Potential for checking both depth and dowel bar placement
 - Data sampling density should be increased

Q: How does the laser do when it's rainy or dusty out?

A: We didn't scan on rainy days but it was dusty on all of those; what we found is that the scan on the subbase shows rain/dust here and there but other points going down to pavement show recognize what surface should be and is manageable. We wouldn't be doing it if it was raining hard.

Q: But rain wouldn't affect the laser itself?

A: No, it's in a case.

Q: Is the laser fixed on the side of the road or on a machine where there's a lot of vibration?

A: Yes, it's put on the machine. We get a lot of vibration and we still can collect data. This is an industrial laser and is well insulated so can take a lot from the environment.

Motion to Approve

Motion by Rick Fosse 2nd by Jim Alleman.

Motion carried with 11 aye, 0 nay, 0 abstaining.

Problem Statement TR-538 Phase II – *Measuring Concrete Pavement Thickness Using Electromagnetic Sensors*, Russell Walters, Iowa State University/CTRE (Budget: \$100,000)

Problem Statement

Estimating pavement thickness is essential to assure project quality; yield quantities are monitored and core samples taken every 2,000 square yards. Concrete cores are labor intensive, destructive and sampling density is limited. In addition, contractor payment is based on estimated thickness.

Background Summary – Based on recommendations of Phase I, Eddy Current Sensors have the potential to measure concrete pavement thickness in the near term, are less labor intensive than drilling cores and lower labor requirements so more samples can be taken. Using Eddy Current Sensors requires a conductive plate under the concrete.

Purpose

- Develop an eddy current based sensor suitable for measuring concrete pavement thickness; handheld version for thickness verification; paver mounted version for thickness monitoring.
- Could also be used to verify bar placement by DBI system

Scope

- Literature review to determine coil diameter, frequency, and power requirements
- Develop test bed at CTRE's new Construction Technology Lab
- Determine relationship between accuracy, coil size, conductive plate size, and thickness

Products

- Specification recommendations
- Conductive plate size, material type, and placement
- Coil diameter and impedance for thickness measurement
- Coil diameter and impedance for dowel bar placement verification
- Final Report

Laboratory study would be part of the project. Phase II of TR-538 would conclude 18 months from the date of contract approval with a budget of \$150k. \$100k is requested from Iowa Highway Research Board with a \$50k match expected from the National Concrete Pavement Technology Center.

Q: Jumping ahead to the next stage...assuming you get a working prototype out there – and it's just something to think about as you develop your recommendations. Who do you envision testing equipment belonging to? The contractor or the contracting authority?

A: At this time we're thinking two different ones. The one attached to the paver is the contractor's for his own quality control; the second belongs to the testing agency for quality assurance.

C: That's one of the issues we're dealing with now in regard to asphalt; independent assurance samplings and Federal Aid Funding Streams. Knowing the dowel bar locations it would be easy to go back with drag-along cart and contracting authority could follow up. There's good promise.

C: As part of your proposal I'd like to see if there's any other research already out there.

A: Sure...yes. We've looked into that and similar things with the DOT.

Q: Can this technique be applied to asphalt?

A: I would think so yes, as long as something really conductive is placed behind it, otherwise it's not going to affect this type of sensor.

C: If you mounted this thing on a vehicle going faster than the paver, how fast could this go and still get good resolution?

A: Not fast. Paver speed.

Q: How high off the surface being put down can the laser be mounted?

A: It drags near the surface at a controlled height between pavement; the thought is that the accuracy and the depth of penetration is the same height as the diameter of coil you're putting on top of it.

Motion to Approve

Motion to approve to proposal stage by Jim Berger 2nd by Mark Nahra.

Motion carried with 11 aye, 0 nay, 0 abstaining.

Proposal, Pooled Fund Study Participation, *The Effects of Implements of Husbandry Farm Equipment on Pavement Performance* (MnROAD Study), Ed Engle, Iowa DOT with special contribution by Halil Ceylan

Problem Statement

- Larger and heavier agriculture equipment is being operated both off and on public highways and local roads
- Even though these load levels occur only during a short period of time during the year (fall for grain carts and spring for honey wagons), there is concern that they are causing significant damage to pavements and bridges especially when they are over loaded.

Notable Literature Findings

Limitations of the past field studies

- Only certain pavement configurations were studied with limited types of heavy agricultural loads
- Impact of environmental effects (temperature, moisture gradients, etc.) on pavement performance was not studied in detail
- Some studies did not include all pavement types (flexible, rigid, granular, etc.)
- Limited number of field studies were conducted

Objective

- Determine the pavement response under various types of heavy equipment from agriculture or other industries
- Model pavement performance (cracking, rutting, etc.) based on load response
- Allow policy and design decisions to be driven by direct experimental results

Project Duration & Funding

- Study Duration is 3 Years (2006 - 2009)
- Total Cost is \$475,000
- Partner Commitment -
- \$35,000 per year
- Commitments (so far)
- \$210,000 (Minnesota DOT & Minn. LRRB)

As of 6/15/2006 MN has not received commitments from other states; however, there may be in the immediate future. Research needs to be done on how different axle types and weight limits affect pavement performance.

C: Wisconsin is discussing this project and it appears they will be involved in this pooled fund study. Minnesota will also be involved. Equipment manufacturers/producers have also promised 20% or 100k; other contributions will also be provided.

C: The County Engineers Executive Board had a presentation by Dr. Ceylan back at their March meeting and they were very enthused about this project; this is a huge problem for counties.

Motion to Approve

Motion to approve by Mark Nahra 2nd by Roger Schletzbaum.

Motion carried with 11 aye, 0 nay, 0 abstaining.

Review/Finalize remaining RFPs for 1st Solicitation for FY 2006-2007

• *Develop Guidelines for Rating Bridges for Overweight/Over-Dimension Vehicles, IHRB 06-02*

To develop uniform guidance for rating bridges and issuing permits. There is also concern regarding all-systems permits and how that's done county-to-county and what ramifications are for using the various restriction models.

Q: How would you deal with roads where you have a mix of standard and small bridges?

A: That's always a challenge; the majority of our bridges are standard bridges. I know this would be a huge help to me; it's something we've been talking about with someone in the Office of Bridge & Design. But this would eliminate the need to call him every time we have a special load case. I think it would still take care of upward 75% or more of all the special loads we have going over our roads.

We need standardization of charges for oversize loads; in addition, this would give us a rating tool and eliminate the need to call DOT when there is a special load.

C: One issue with a standard is that it doesn't reflect any problems like section loss on beams. It's rated based on if there is no problem with the bridge.

C: If a bridge is in poorer condition, one would need to make adjustments.

C: A lot of work has been done already; there won't be a need to start at square one.

A: With the work that's already been done, I hope they can create the tool that will allow us to build that truck graphically and estimate standards for the load case.

Mark: Would it be better to do an RFP or do a consultant selection?

C: It seems like it would be better in the hands of a couple consulting firms...

C: It would seem to me that Mark would want to coordinate the permitting task through the Service Bureau or LTAP.

C: The Service Bureau would be ideal for collecting the permit information. Maybe we could get the Bureau into an advisory role and involved in the portion of the report to develop controls...and in the selection process.

Mark: I will look at splitting this into 2 different projects; I can work with the Bridge Office and normal consultant selection or if it's small enough, they may have a state-wide consultant already selected for certain types of work, as was done with other standards.

C: Mark Nahra volunteered as technical contact.

- ***Utility Cut Repair Techniques, Phase II IHRB 06-03***

Recommendation by Mark Dunn to request Proposal from Iowa State University rather than proceed with widely distributed RFP.

Motion for Proposal Request From the Phase 1 Project Team Rather Than Issuing an RFP

Motion to approve by Mark Nahra 2nd by Bob Younie.

Motion carried with 11 aye, 0 nay, 0 abstaining.

- ***Alternative Replacement/Rehabilitation Methods for Small Span Structures, IHRB 06-04***

Mark: This has come up before; a lot of these issues have been addressed in other reports in the last 5-6 years. We could do a review to find out what work has been done, summaries and further review to find out what's out there before going ahead.

A list has been sent out to county engineers summarizing what has previously been done and priorities in certain areas. We've gone ahead with a few precast projects and are reviewing if there is a need to go ahead further with this. I sent out TR-452 to counties as well. After a chance for review we can see if there's a need there and what options are missing.

C: I'm getting the impression we're not publicizing enough what's out there. If we were going to do anything for this project, a synthesis might be what's needed...but if you read TR-542 in chapter 2 it presents the body of work we've done since 2004.

Mark: It may be as simple as going to the County Engineer's office and presenting some of the alternatives that already exist. If it comes down to publicizing what's already been done and making that more available we'll try and go forward on that.

- ***Modified Sheet Pile Abutments for Low Volume Bridges, IHRB 06-05***

Mark: This is looking at using sheet pile abutments for bearing, as well as retaining walls.

C: New York State has a bridge abutment using heavy gauge sheet pile as both the bearing and soil restraint system; I don't know if it's been load tested or looked at...it's an all-steel substructure utilizing steel H-pile and sheet pile backwall. I don't know if anyone here has investigated the possibility of strictly using sheet pile.

Mark: In New York there are varying opinions and it hasn't been load tested.

- ***Iowa Bridge Backwater Program Enhancements, IHRB 06-06***

Mark: The Iowa Bridge Backwater Program was developed by Dr. LaDon Jones, Digital Control, Inc. Since Dr. Jones fully understands the architecture of the program and had the necessary technical expertise in fluid hydraulics, he is uniquely positioned to conduct the objectives of this project. It is recommended that a proposal be requested solely from Digital Control, Inc., for this project.

C: With the StreamStats work by USGS; that's the likely source of importation of figures. We should state that's where he should look at the output. It's a well-developed product in Idaho and a couple of other western states, so the manner in which that can be exported is something that can be explained to them. Let's try and take into account the next generation of stream data because that's going to be their mechanism for sharing the new regression equations on drainage areas of less than 60 square miles.

Motion to Approve

Motion to Approve asking Dr. Jones for a proposal - by Roger Schletzbaum 2nd by Larry Jesse.
Motion carried with 11 aye, 0 nay, 0 abstaining.

New Business

The IHRB will be back in Ames for the July 28, 2006 meeting; however, we will be meeting at the Scheman Center, Room 299 at Iowa State University because the large conference room at the DOT is being remodeled.

Presentations

During lunch, Connie Mutel, IIHR Historian and Archivist, presented the history of the Hydraulics Laboratory and IIHR. Steve Beck, Manager Research & Development Projects, presented an overview of current research taking place at the Center for Computer-Aided Design (CCAD), National Advanced Driving Simulator (NADS) and the Virtual Soldier Research Program.

(After lunch a guided tour was presented of the above research facilities at The University of Iowa by Dr. Rob Ettema.)

Rob Ettema entertained a Motion to Adjourn. Moved by Mark Nahra. 2nd by Larry Jesse. Carried with 11 yea, 0 nay and 0 abstaining.

Mark J. Dunn, IHRB Secretary