

IOWA HIGHWAY RESEARCH BOARD (IHRB)

Minutes of May Travel Meeting held June 1, 2007

Regular Board Members Present

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

M. Nahra
R. Schletzbaum
J. Rasmussen
D. Waid

Alternate Board Members Present

R. Younie for S. Dockstader
W. Zitterich for J. Adam

Board Members with No Representation

J. Joiner
J. Krist
S. Gannon
J. Singelstad
J. Alleman

Secretary

M. Dunn

Visitors

Ken Dunker
Ed Engle
Mike Heitzman
Dustin Skokerboe

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

Robert Abendroth

Iowa State University/CCEE

The meeting was held in the Advanced Technology Building, Room 125, Indian Hills Community College, Ottumwa, Iowa. The meeting was called to order at 9:00 A.M. by substitute Chairman Mark Dunn with 9 voting members/alternates at the table. One Member joined the table later bringing the total to ten voting Members.

Agenda review/modification

Items 9 (Presentation of Transportation Impacts of Ethanol Production, Gregg Hayes/Jim Johnson, Cargill, Inc.) and 12 (Tour of Cargill Inc., Eddyville, IA) on the Agenda were cancelled.

Approval of the minutes

Motion to approve the minutes from the April 28, 2007 meeting by R. Younie. 2nd by M. Nahra.
Carried 9 yea, 0 nay, 0 abstaining.

FINAL REPORTS

FINAL REPORT TR-438, “Integral Abutment Bridge with Precast Concrete Piles,” Mike LaViolette, ISU/HNTB (\$142,903)

BACKGROUND

Previous integral abutment bridge research sponsored by the Iowa Department of Transportation (IA DOT) and conducted by researchers at Iowa State University (ISU) was confined to bridges supported by structural steel/HP-shaped abutment piles. In 1999, the Tama County Engineering Office in the State of Iowa constructed a single-span prestressed concrete (PC) girder, integral abutment bridge that was supported by PC piles. The bridge replaced an existing structure over Otter Creek on County Road E43 in Tama County, Iowa. This bridge, the Tama County Bridge, was the first integral abutment bridge with PC piles constructed in the State of Iowa.

PURPOSE

To investigate the performance of PC piles that support integral abutments; specifically, to investigate the performance of the PC piles in Tama County Bridge.

SCOPE

A literature review was conducted that focuses on the use of PC piles to support integral abutment bridges and a bridge monitoring program was developed to measure: long-time air and concrete temperatures, longitudinal strains in two abutment piles, longitudinal and transverse displacements for the abutments, pile-head rotations relative to an abutment pile cap, and abutment rotations in a vertical plane that is parallel to the length of the bridge.

An integral abutment bridge that has PC piles to establish its response to thermal loading was monitored and the resulting field records were evaluated and interpreted.

CONCLUSIONS

The overall bridge movement occurred primarily at the east abutment. The magnitude of these longitudinal movements fell into the low end of the expected range of movements for a bridge of this length. The recorded longitudinal movement at the west abutment was negligible.

Subsequent excavation of the center pile of the east abutment provided photographic evidence of the pile cracking. Because pile cracking may allow moisture penetration and subject the uncoated prestressing strands to long-term corrosion, periodic inspection of the abutment piles to detect any additional concrete cracking or deterioration is recommend.

- Virtually all longitudinal thermal movement occurred at east abutment which was found to “rotate” in plan view due to skewed ends.
- Effectiveness of carpet wrap is debatable.
- Pile strain data appears to indicate the formation of a crack between October 12 and October 23.
- Subsequent excavation of piles provides evidence of cracking.
- Recommend future periodic inspections of piles to observe potential deterioration.

C: Research has shown that the cracking isn’t necessarily a big problem because if the pile does crack, the pile is still in compression although moisture does invade that crack. A solution might be epoxy-coated strands.

Motion to Approve by J. Berger, 2nd by J. Rasmussen.
Carried 9 yea, 0 nay, 0 abstaining.

Mark Dunn spoke about the new Implementation Project Closure Report (IPCRs) These required reports are to be included in Final Reports for research projects and available to the Board for review. They will indicate how the project will be utilized and what aspects may be missing or need to be expanded into new research applications. IPCRs will incorporate recommendations by project Technical Advisory Committee members during their last meeting; specifications affected by research conclusions, implementation leads and barriers to future applications should be noted.

C: Implementation status could be presented several months after the final report is presented to the Board.

FINAL & IMPLEMENTATION REPORT TR-547, “Investigation of Electromagnetic Gauges for Determination of In-Place Density of HMA Pavements,” Chris Williams, ISU, (\$50,896)

- One Member joined the table bringing the voting total to 10 Members. -

BACKGROUND

In Iowa, asphalt pavements are cored to determine in-place density and evaluate a contractor’s work for compaction quality. Electromagnetic density gauges that are available have the potential to replace long used nuclear density gauges and the process of coring, thus eliminating safety concerns associated with radioactivity. Non-nuclear devices use electromagnetic fields to measure in-place density. The use of electromagnetic fields have the advantages of completely eliminating the licensing, training, specialized storage, and risks associated with devices that use a radioactive source and also being non-destructive.

PURPOSE

The primary objective of this research is to establish the accuracy and precision of a PQI model 301 electromagnetic gauge manufactured by Trans-Tech and a PaveTracker model 2701 electromagnetic gauge manufactured by Troxler as compared to core testing. A subsequent objective is to determine which gauge, if either, should be considered for quality control and quality assurance in Iowa.

SCOPE

Assuming a non-nuclear device or system is identified as a suitable replacement of core samples for evaluating in-place asphalt pavement density, an implementation plan will be developed to include recommended calibration procedures, methods for assessing measurement variability, and routine operation of the device or system for the Iowa DOT and participating contractors as well as their representatives.

CONCLUSIONS

Several mix- and project-specific factors affect electromagnetic gauge readings. Consequently, the implementation of these gauges will likely need to be done utilizing a test strip on a project- and mix-specific basis to appropriately identify an adjustment factor for the specific electromagnetic gauge being used for quality control and quality assurance (QC/QA) testing. The substantial reduction in testing time that results from employing electromagnetic gauges rather than coring makes it possible for more readings to be used in the QC/QA process with real-time information without increasing the testing costs.

To ensure the appropriate implementation of electromagnetic gauges, there is a need for additional work that considers the utilization of test strips, increased electromagnetic gauge testing frequency, and new electromagnetic gauges that have entered the construction industry.

Q: You mentioned newer models using different frequencies; are there other directions the industry is considering to narrow the gap in density evaluation equipment?

A: My preference would be to consider multiple frequency equipment; the electronics industry has substantially improved over the years and this type of gauge has become more economically feasible.

Q: What's the vision for this type of testing device?

A: As regards to compaction and density, there are several things available, such as intelligent compaction. Intelligent compaction today does not supply nearly the quality readings of electromagnetic gauges; the situation with intelligent compaction is that the same machine/roller is applying the load and it is the reaction in the frame that's making the measurements. They are not independent of each other; if there were increased test frequency with non-destructive technology intelligent compaction could be verified and the technology applied more broadly. Also, small sensors could be imbedded in the pavement for wireless readings of temperature and stress for application with intelligent compaction; however, gauges are currently being used and found of value.

C: The best return on our dollar in the long term would be to eventually get away from invasive core testing.

Motion to Approve by R. Schletzbaum, 2nd by D. Wade.

Carried 10 yea, 0 nay, 0 abstaining.

INTERIM REPORT

Interim Report TR-557, "Evaluation of Lignin Derived from Agricultural Co-Products as an Anti-Oxidant in Asphalt," Chris Williams, ISU, (\$50,000) Presented by Nick McGrady, an ISU Master's Degree student working with Chris Williams.

As a pavement ages, oxidation from the pavement binder causes cracks and pavement fails; this research seeks to determine if oxidation can be inhibited or slowed by using agricultural derived anti-oxidant components of corn lignin.

Full testing of four binding lignins indicate that generally, the more lignin added the stiffer the binder becomes; 9% lignin is the optimum percentage for best results in cold climates. In warmer climates, 12% lignin additive is optimal but in cold weather it is believed this higher percentage would increase susceptibility to cracking. In the future, only the cellulose of the corn will be tested without the lignin to examine what affects that produces in stiffening, if any.

Work continues with examination of specific gravity and solubility on the binders with collected results currently under review; a literature review is finished. Analysis of results continues in preparation for writing of a final report.

C: Bio oil derived from switchgrass is also under investigation by other research entities with CTRE having applied for funding to explore this related research topic. It is hoped that the TAC for TR-557 in Phase II can find funding from the Iowa Energy Center for continued research.

Q: What's the cost of the lignin coming from the ethanol plants?

A: Currently the corn based product is about \$40 a ton.

C: Stiffness on the average county road pavement is not what we're trying for; polymers can assist with the low temperatures range going down.

A: We're not seeing a substantial change in the role of temperature, but temperature susceptibility range is low. That might mean we could use some binders being excluded from consideration right now; we can probably all agree that the bio-energy sector is growing substantially.

C: Additives have to show the benefits to justify the cost.

No action was necessary by the Board.

IMPLEMENTATION REPORT

Implementation Report TR-528, "Development of a New Process for Determining Design Year Traffic Demands," Neal Hawkins, ISU/CTRE (\$125,000)

Agenda Item 6 was discussed at the previous meeting. The Implementation Report for TR-528 was made available to Board members. Because of time restraints Item 6 was skipped.

No action was necessary by the Board.

NEW BUSINESS

A.) Letter of Support

Mark Dunn noted he'd been approached by a group of researchers putting in a proposal for a new Federal Highway Administration (FHWA) project to research speed activated displays on curves and their effects; the general objective is to conduct field tests of low cost dynamic warning systems. These are in the range of \$10,000 or less and will be installed on rural roadways' horizontal curves in determining effectiveness in managing speeds and reducing crashes.

FHWA has called for proposals on this; CTRE is joining with Texas Transportation Institute and will possibly be allocated \$300,000 from Federal Highway that would require a 50/50 match. Texas has committed \$150,000; we are currently investigating if Midwest Transportation Center funds can be used as a contribution.

A letter of support has been requested; no commitment of funds is needed at this time.

Q: How does this system work?

A: This system provides a warning message when drivers are exceeding a safe speed threshold so they can slow down to safely navigate the upcoming curve; the IA DOT Traffic and Safety Office are interested in this and will probably provide a portion of the matching funds. They are hoping for a vote of support in order to acquire federal funding.

Modifications have been made to curve locations without too much improvement; this project would provide information for an alternative solution.

Motion to Approve Letter of Support by M. Nahra, 2nd R. Younie.
Carried 10 yea, 0 nay, 0 abstaining.

B.) RFPs for LRFD Pile Design

1. Developing Design Procedures for Friction Piles in Western Iowa
2. RFD Piles Designs (Replacement of ENR)

Discussions with the IA DOT Bridge offices has resulted in the question of whether or not these two studies should be merged with the current LRFD Pile project or approached as separate RFPs.

C: They could both be done as part of one study, but load testing might become expensive. This is something to consider.

C: They do complement each other.

Q: Could a mutual report address the ENR aspect in western Iowa? It seems the end results would be different.

A: Somewhat; as far as the replacement for ENR, if you don't switch over to LRFD you wouldn't need that extra research.

C: Training must be emphasized.

Q: Are there any objections to pursuing a proposal from the present project team?

A: It's worth working with people who have the expertise.

C: The cost of the load testing will be considered in whether this should be two projects or one.

Motion to Approve Requesting a Sole Source Proposal from the Current Project Team by M. Nahra,
2nd Ahmed Abu-Hawash.

Carried 10 yea, 0 nay, 0 abstaining.

Motion to Adjourn

Motion to Adjourn by W. Zitterich. 2nd by R. Younie.

Carried 10 yea, 0 nay, 0 abstaining.

Individuals were invited to visit the Ottumwa Roundabout intersection at Highways 34 & 63.

The next scheduled meeting for the Iowa Highway Research Board will be held Friday, June 28, 2007 AT 9:00 a.m. at the IA DOT Materials Building, Ames, IA.

Mark J. Dunn, IHRB Secretary