

IOWA HIGHWAY RESEARCH BOARD (IHRB)

Minutes of IHRB meeting held June 29, 2007

Regular Board Members Present

A. Abu-Hawash
J. Adam
J. Alleman
J. Berger

S. Gannon
J. Joiner
J. Krist
R. Schletzbaum
J. Singelstad

Alternate Board Members Present

D. Ahart for J. Rasmussen
C. Swan for R. Ettema
J. Waddingham for T. Fonkert
R. Younie for S. Dockstader

Board Members with No Representation

D. Waid
M. Nahra

Secretary

E. Engle for M. Dunn

Alternate Board Members as Guests

M. Kerper
W. Zitterich

Visitors

Leland Smithson

AASHTO

Robert Nady

Construction Materials Testing

Jerry Roche

FHWA

Chris Brakke

Iowa Department of Transportation

Ed Engle

Iowa Department of Transportation

Mike Heitzman

Iowa Department of Transportation

Sandra Larson

Iowa Department of Transportation

Dustin Skokerboe

Iowa Department of Transportation

Chuck Jahren

Iowa State University

Shashi Nambisan

Iowa State University

Muhannad Suleiman

Iowa State University

David White

Iowa State University

Agenda review/modification

Item 3 - Mike Sheehan, Minnesota Local Roads Research Board, visit postponed; Item 8 - Proposal *Effects of Pre-Wetting and Anti-Icing Brine on the Performance Cracked Bridge Decks*, Faoud Fanous, postponed.

Announcement: Board Member Rob Ettema has accepted the position of Dean of Engineering at The University of Wyoming; he will leave the Board after the July 27, 2007 meeting.

Approval of the minutes

Motion to approve the minutes from the May Travel Meeting held on June 1, 2007 by R. Younie. 2nd by R. Schletzbaum. Carried 12 yea, 0 nay, 0 abstaining.

FINAL REPORTS

FINAL REPORT TR-531, “Effective Shoulder Design and Maintenance,” David White, Iowa State University/CTRE (\$103,823)

BACKGROUND

Granular shoulders are an important element of the transportation system and are constantly subjected to performance problems due to erosion, rutting, edge drop-off and slope irregularities. Such problems can directly affect motorist safety and often require regular maintenance.

SCOPE

Research included observations made during a field reconnaissance study, findings from an effort to stabilize the granular and sub-grade layer at six shoulder test sections, and the results of a laboratory box study where a shoulder section overlying a soft foundation layer was simulated.

OBJECTIVES

- Identify practices for design, construction, and maintenance of granular shoulders that result in reduced rutting and edge drop-off, improved safety, reduced maintenance costs, and extended performance life, with recommendations specific to Iowa materials and conditions.
- Document several granular shoulder sites where poor and good performance has been observed in order to better understand the factors contributing to shoulder problems.
- On a pilot study basis, evaluate and compare the performance of several test sections using chemical stabilization (e.g., fly ash and cement) and mechanical reinforcement (e.g., geogrid) techniques, including application of waste and recycled materials in construction (e.g., limestone screenings, recycled concrete, or recycled asphalt).
- Perform a cost/benefit analysis to investigate owner costs of alternative systems.

CONCLUSIONS

- A minimum CBR value for the granular and sub-grade layer should be selected to alleviate edge drop-off and rutting formation.
- For those constructing new shoulder sections, the design charts provided can be used as a rapid guide based on an allowable rut depth. The charts can also be used to predict the behavior of existing shoulders.
- In the case of existing shoulder sections overlying soft foundations, the use of geogrid or fly ash stabilization proved to be an effective technique for mitigating shoulder rutting.

*** One Member joined the table bring the voting total to 13***

Q: Did you say that there was a particular type of soybean oil that works best? Is there a specification for oil?

A: We found out about this through a literature search and tried out a couple of types; the first one didn't work very well. The second one was only tested in the laboratory but worked well.

Q: Were conditions across the state examined?

A: Yes, we did look statewide; slope and water are big issues. There is a direct correlation between edge drop and accident fatalities. FHWA is promoting the idea of a chamfered edge on the pavement so it is easier to get back onto the pavement.

Q: Was the type of maintenance work examined in relation to the level of CBRs over time?

A: The areas we looked at were in very bad condition and not routine; they were off the chart.

Motion to Approve by J. Adam, 2nd by J. Berger.

Carried 13 yea, 0 nay, 0 abstaining.

FINAL REPORT TR-474, “Validation of the Mix Design Process for Cold In-Place Rehabilitation Using Foamed Asphalt – Phase II,” David Lee, The University of Iowa (\$140,842)

BACKGROUND

Asphalt pavement recycling is currently the preferred way to rehabilitate existing asphalt pavements, employing different techniques. One technique, Cold In-place Recycling with foamed asphalt (CIR-foam), has been effectively applied in Iowa. However, the current CIR-foam practice utilizes a generic recipe specification without a mix design, giving a contractor latitude to adjust the proportions of the foamed asphalt content to achieve a specified level of density.

SCOPE

After summarizing the conclusions and recommendations from Phase I, the developed mix design procedure was then validated using different sources of RAP materials. The simple performance tests were conducted to evaluate the consistency of a new CIR-foam mix design process to ensure reliable mixture performance over a wide range of traffic and climatic conditions. Pavement surface conditions of seven CIR projects were evaluated after one year since construction, where the RAP materials had been collected in the summer of 2004. Finally, the CIR-foam construction processes from milling to compaction were observed.

OBJECTIVE

Develop a new laboratory mix design process for CIR-foam in consideration of its predicted field performance.

CONCLUSIONS

- Gyrotory compactor produces the more consistent CIR-foam laboratory specimen than Marshall hammer.
- Indirect tensile strength of gyrotory compacted specimens is higher than that of Marshall hammer compacted specimens.
- Indirect tensile strength of the mixtures cured in the oven at 60°C for 2 days is significantly higher than that of mixtures cured in the oven at 40°C for 3 days.
- Dynamic modulus of CIR-foam is affected by a combination of the RAP sources and foamed asphalt contents.
- The coarse RAP materials with a small amount of residual asphalt content may be more resistant to fatigue cracking but less resistant to rutting.
- CIR-foam is not as sensitive to temperature or loading frequency as HMA.
- Based on the dynamic creep tests performed at 40°C, CIR-foam with 1.0% foamed asphalt is more resistant to rutting than CIR-foam with 2.0% or 3.0%.
- Based on the dynamic creep tests performed at 40°C, RAP aggregate structure has a predominant impact on its resistant to rutting.
- Based on the dynamic creep test results performed at 40°C and dynamic modulus test performed at 37.8°C, the finer RAP materials with the more and harder residual asphalt were more resistant to rutting.
- CIR-foam specimens with 2.5% foamed asphalt content are more resistant to raveling than ones with 1.5%.
- There is a significant variation in distribution of foamed asphalt across the lane during the CIR-foam construction, which could affect its field performance.

Q: Is there a technical summary in the final report?

A: There is a summary in the final report.

Q: Does the absence of a technical brief affect our voting for acceptance of this report?

A: No, a technical brief will be produced in the near future.

Motion to Approve by R. Younie, 2nd by A. Abu-Hawash.
Carried 13 yea, 0 nay, 0 abstaining.

FINAL REPORT TR-502, "Evaluation of Long Term Field Performance of Cold In-Place Recycled Roads," Charles Jahren, Iowa State University/CTRE (\$145,216)

BACKGROUND

In order to keep an asphalt pavement at a certain acceptable level of serviceability, highway agencies need to select an appropriate rehabilitation. Studies have shown that transverse and longitudinal cracks in asphalt pavements overlaid with one or two inches of HMA will reflect through the overlay within two to four years; as a result, there exists a national trend away from overlay and reconstruction to recycling of existing distressed pavements. There are several methods to recycle asphalt pavements. One promising method is cold in-place recycling (CIR). This report focuses on the performance evaluation of CIR asphalt pavements.

SCOPE

This study comprised field distress surveys, field testing and laboratory testing for 24 CIR asphalt roads constructed from 1986 to 2004 at various locations throughout the state of Iowa. Of these 24 projects, 18 projects were selected from a sample of roads studied in a previous research project (HR-392). The other six projects were selected from newer CIR projects constructed in Iowa after 1999.

OBJECTIVES

- To determine the effects of traffic, age, and support conditions on pavement performance.
- To determine how these effects are explained by the aged engineering properties of the CIR materials and other factors.
- To determine what changes should be made with regard to design, material selection, and construction in order to improve the performance of future recycled roads.

CONCLUSIONS

It was found that among the variables in this study, the modulus of the CIR layer and the air voids (Va) of the CIR asphalt binder were the most important factors affecting CIR pavement performance for high-traffic roads in the first-order model and for all 24 CIR roads in the higher order model. The IDT wet value significantly affected pavement performance in the first-order model for low-traffic roads.

Q: Is there a difference between the foamed and emulsion bases? Was there an opportunity to determine that?

A: We had three foamed and 26 of the other; not really enough to determine that.

Q: Does this impact maintenance level efforts?

A: No.

Q: Were any areas studied with whitetopping?

A: Yes, Dr. Cable has a few test sections.

Q: What's the influence of thickness of the HMA overlay?

A: That was not examined; most test sections were standard 4" overlays.

Q: Were these all full depth asphalt?

A: We had one road that was composite, but it wasn't included in the analysis.

Q: What is the view on cold in-place vs. rehabilitation?

A: We see a delay in reflective cracking and it is more economical.

Motion to Approve by J. Berger, 2nd by R Schletzbaum
Carried 13 yea, 0 nay, 0 abstaining.

Edward Engle discussed newly formalized implementation procedures: specific ways the TAC recommend that IA DOT, counties and cities can implement approved research projects; also, IA DOT staff will re-examine (16-18 months after approval) and confirm that recommendations have been implemented (for example, a specification being changed).

Specific tasks are listed on the implementation form developed by the IA DOT; future implementation reports will be shared through the county service bureau and at the county engineering meetings, as well as by those on the TAC.

Section 4 of the form should focus on implementation and not on the need for future research.

FINAL REPORT TR-471, "Evaluation of Using Non-Corrosive Deicing Materials and Corrosion Reducing Treatments for Deicing Salts," Wilfrid Nixon, The University of Iowa (\$100,000)

BACKGROUND

The implementation of anti-icing as a winter maintenance strategy has coincided with a proliferation of new ice-control products. These new products are sometimes stand alone products, and may also be additives that can be mixed with more traditional chemicals with the intent of either improving de-icing performance or mitigating the negative side effects of these traditional chemicals, especially their corrosive properties. As agencies switch from a de-icing strategy to an anti-icing strategy, many of these new products are being suggested (sometimes quite aggressively) as the best new products to use in winter maintenance. Many products provide little or no information about effectiveness and capability, and certainly no standard forms of reporting such data exist.

SCOPE

This study presents a series of performance measurement tests for liquid ice-control products, and discusses the role that they can play in such a quality control program. Some tests are simple and rapid enough that they can be performed on every load of ice control products received, while for others, a sampling technique must be used. An appropriate sampling technique is presented. Further, each test is categorized as to whether it should be applied to every load of ice-control products or on a sampling basis.

OBJECTIVES

- To develop a series of performance measurement tests for liquid ice-control products
- To discuss the role product testing can play in a quality control program
- To establish testing categorizations for varied products
- To develop a detailed description of how to conduct each test
- To present a method that allows an agency to have a high degree of confidence in the performance not only of the ice-control products currently used by the agency, but also of any new ice-control products that might be introduced in the future (with relatively little effort and cost)

CONCLUSIONS

A process has been recommended that would make use of the four specification tests (specific gravity, viscosity, ice melting capacity, and freeze point determination) to ensure the continued quality and acceptability of any ice-control product used by an agency. This process requires testing each load for specific gravity, and requires less frequent use of the other three test types with the frequency being dependent upon the degree to which prior product deliveries have met specifications. The process uses baseline information from the supplier, and requires that a sample be taken and retained from each load of product delivered.

Q: Does IA DOT have specifications on their dry salt?

A: Most states do, Iowa does in reference to percentage of salt and heavy metals in a load.

Q: What other states were surveyed for specifications on liquids?

A: The Pacific Northwest Snowfighters were surveyed; their focus is corrosion resistance, which was included in another project but not this one. The difficulty is the relationship between a specification test and a field performance test. Washington State, for example, has run a salt pilot program where samples are put out on the road and corrosion is observed subject to their specifications. The result is an expectation that any liquid used be 70% less corrosive than on a straight salt road. They found calcium chloride products they use have a corrosion inhibitor which met the specification in the lab also met that 70% requirement in performance tests in the field. There were others which did not meet the requirements.

Q: What portion of material is bought pre-mixed or by brand name?

A: Very little.

C: After review, there are some editorial modifications that needed to be made, including a change of title for the report. The word “Using” will be removed from the title to better reflect the focus of the report.

Motion to Approve by R. Younie, 2nd by J. Adam
Carried 13 yea, 0 nay, 0 abstaining.

PROPOSAL

Proposal Investigation of Electromagnetic Gauges for Determination of In-Place Density of HMA Pavements – Phase II, Chris Williams (39,795)

BACKGROUND

Phase I of this research found electromagnetic gauge technology to be promising for use in determining the density of intermediate and surface course mixtures. A number of factors were identified, which are primarily mix-specific, that affect electromagnetic gauge readings (density values). These effects can be taken into account by relating the gauge readings to core density values by establishing and applying a “correction factor” to gauge readings. However, there is a need to understand whether the correction factor obtained in the first day of paving operations for a specific mix and paving conditions is applicable for the ensuing paving days under the same paving operations and conditions.

SCOPE

This will determine whether correction factors are applicable over multiple days within normal and acceptable material variations. Further, the variability will be examined to determine the appropriate electromagnetic gauge reading frequency that is needed to overcome potentially higher variability in gauge measurements than that of cores. The nondestructive testing and fast measurements make the gauges viable technology for use in quality control and quality assurance testing of hot mix asphalt pavements.

OBJECTIVES

- To determine the consistency of gauge correction factors for multiple paving days
- To determine the number of gauge readings required for representative quality assurance testing

BENEFITS

The anticipated benefit from this research is that the use of electromagnetic gauges can be implemented in lieu of core density measurements. This represents nondestructive testing of the hot mix asphalt pavements, and makes the quality assurance data available the same day as the hot mix is placed. Furthermore, more gauge readings can be taken than core samples that are currently being tested for quality assurance. It is likely the increased number of test locations will be more representative of the overall pavement density quality than what is currently being done via core sampling.

Q: What is the rationale behind the EM gauges as opposed to the nuclear density gauges used in soil density testing?

A: Licensing; nuclear density gauges must be licensed and training is required.

Q: Is the technology of the instrument progressing at a rapid rate?

A: The concept has been studied for about five years; this is not a new concept. Each generation of gauge is improved. Software has been developed to pull out the information, so a plateau has seemingly been reached.

C: From a construction point of view, if we could do something to minimize coring, it would be a tremendous thing in relation to safety, maintenance and impact.

Q: Is the gauge used on the surface?

A: Yes, it is used right on the surface.

Motion to Approve by J. Joiner, 2nd by J. Krist

Carried 13 yea, 0 nay, 0 abstaining.

PRESENTATION - Roundabout Task Force Update – Hillary Isebrands

Hillary Isebrands spoke via the telephone to the Board regarding the Roundabout Task Force. Goals are:

Task 1 – Organize Iowa DOT Roundabout Task Force

Task 2 – Literature Search

Task 3 – Synthesis of Practice

Task 4 - Draft Iowa DOT Roundabout Policies

Task 5 - Draft Iowa DOT Roundabout Design Screening Tools and Design Guidelines

Task 6 – Finalize Roundabout Design Policies and Guidelines

Task 7 - Public Involvement and Educational Support

Task five of the Roundabout Guidance for the IA DOT, *Draft Iowa DOT Roundabout Design Screening Tools and Design Guidelines* will be completed soon. Table of Contents include: General Information, Definitions, Key Roundabout Features, Safety, Operations, Considerations and Feasibility, References, More Information And Contacts. This is a planning level document. Specific design information will be produced in the future in conjunction with the IA DOT sometime in September.

Q: When you say “deliverable by August” do you mean tasks four and five?

A: That would be tasks five and six; right now the planning level guideline is in draft form and should be approved next week. The design level document (a supplement to the planning document) will be completed this August-September. Task five has been changed to be a planning level document.

The presentation included discussion of images presenting before and after construction views of the Ottumwa roundabout at US 63 & US 34: Unlike a typical roundabout, this location’s ramps are free-flow with different posted speeds (45 mph for off-ramp and 10 mph for entrance into the roundabout). There is no curb and gutter and the splitter island is not flared. There is an issue with trucks not using the truck apron at the site.

C: We’re running out of time; please give us your email address and if there are any questions or input we can email you. How does that sound?

A: Good. My email address is: hillaryi@iastate.edu. I’d be happy to answer any questions you may have.

No action was required by the Board.

FINILIZE 2007-2008 - First Round of Selected RFPs

07-02, *Pavement Markings for Safety*

Budget suggestions: \$100,000

Timeline: 12-18 months

C: The idea for this came out of a TRB meeting regarding some California research. The question is, how do you relate brightness of pavement marking lines to safety? We believe the brighter the line, the safer. Different research implies different things, but here in Iowa we have good data on reflectivity and crash data. We have a unique opportunity to study this.

C: For the dollar amount we just need a ballpark that the researcher can aim for.

C: 18 months seems like a long time.

C: I was thinking six months.

C: This is more than merging two databases; it also involves looking at gaps at the causal factors. Reflectivity readings are collected only twice a year, but crashes happen throughout the year. Visibility and night crashes also are factors.

C: We could say 12-18 months.

Q: Anything on the technical side?

C: One thing we might consider is the degeneration of reflectivity over time and if accidents increase as that happens. This type of information might help us.

C: Reflectivity of the signage is also a factor.

C: The value of this isn't so much the connection between reflectivity and crashes, but what is the minimum reflectivity requirement for a line to be safe? 18 months is probably good. They'll need to go through these and determine what type of crash happened and how the line affected the accident.

IHRB 07-05, *Evaluation of Rumble Stripes in Reducing Run-off Road Crashes and Improving Pavement Edge Line Visibility and Longevity*

Budget suggestions: \$50,000

Timeline: 12-18 months

C: ISU currently has \$30,000 funding through IA DOT's Office of Traffic and Safety and a proposal for \$21,000 from the FHWA has been submitted. Sole source is recommended because of the matching funding; IHRB funds would be for the construction only. Monitoring and evaluation is under a different project.

Q: What do you mean by "construction only"?

A: Paving shoulders and placement of rumble stripes.

Q: Are we buying concrete and steel for this project or paying for research?

A: For the pavement that is going to be put down; this would pay for the disturbance of placement and the new edge line.

Q: Is this going to be in relationship to an Iowa School Road Program?

A: No.

Q: Is it fair to say our money will be buying a before and after study?

A: Yes.

IHRB 07-06, *Development of a Low Cost, Agricultural-based Deicing Product with Improved Performance over Standard Deicing Chemicals*

Budget suggestions: \$75,000-\$100,000

Timeline: 12-24 months

C: The potential is to use an alternative existing waste product (readily available in Iowa) without having corrosion tied to their use.

C: Wilf Nixon's research is complete and there is a need to build on that.

C: There are some by-products available now and some that can be developed.

C: Some are being used now; a liquid being sprayed on the road obtained from the ethanol plant. They're using the same equipment to place it as they use in agricultural fields.

NEW BUSINESS

Shashi Nambisan, ISU/CTRE, thanked the Board for the letter of support for CTRE's hosting of the International Low Volume Road Conference in 2011; however, it was announced that the conference will be held in Orlando, FL. Also, on August 16-17 the Transportation Symposium will be held at ISU and everyone is invited.

Sandra Larson said that several areas of research will be addressed simultaneously at the conference, so attendees can focus attention on their interests; also, for the peer exchange, other states will be invited to attend and may do presentations. The topic of interest will be tech transfers.

Motion to Adjourn

Motion to Adjourn by J. Berger. 2nd by R. Younie.

Carried 13 yea, 0 nay, 0 abstaining.

The next scheduled meeting for the Iowa Highway Research Board will be held Friday, July 27, 2007 AT 9:00 a.m. at the IA DOT Materials Building, Ames, IA.

Mark J. Dunn, IHRB Secretary