IOWA HIGHWAY RESEARCH BOARD (IHRB)
Minutes of IHRB meeting held August 24, 2007

Regular Board Members Present

A. Abu-Hawash
J. Alleman
J. Berger
T. Fonkert
S. Gannon
J. Joiner
J. Krist
M. Nahra
J. Rasmussen
R. Schletzbaum
J. Singelstad
D. Waid

Alternate Board Members Present

W. Zitterich for John Adam

Board Members with No Representation

S. Dockstader
K. Hornbuckle

Secretary

M. Dunn

Alternate Board Members as Guests

None

Visitors

Ed Engle	Iowa Department of Transportation
Sandra Larson	Iowa Department of Transportation
Mary Starr	Iowa Department of Transportation
Shauna Hallmark	Iowa State University/CTRE
Shashi Nambisan	Iowa State University/CTRE
Larry Stevens	Iowa State University/CTRE

Agenda review/modification
None

Approval of the minutes
Motion to approve the minutes from the June 29, 2007 meeting by R. Schletzbaum, 2nd by J. Krist. Carried 12 yea, 0 nay, 0 abstaining.

FINAL REPORTS

FINAL REPORT TR-549, "Roadway Design Standards for Rural and Suburban Subdivisions, Paul Weigand, Iowa State University/CTRE ($112,500)

BACKGROUND
In Iowa, there are currently no uniform design standards for rural and suburban subdivision development roadways. Without uniform design standards, many counties are unable to provide adequate guidance for public facilities, particularly roadways, to be constructed as part of a rural subdivision development. If a developer is not required to install appropriate public improvements or does not do so properly, significant liability and maintenance expenses can be expected along with the potential for major project costs to correct the situation.

PROBLEM
Not having uniform design standards for rural and suburban subdivision development improvements in Iowa creates situations where there is potential for inconsistency and confusion. Differences in the way development

standards are applied also create incentives or disincentives for developers to initiate subdivision platting in a particular county.

OBJECTIVES
To bring cities and counties together to address concerns and identify where growth is going to be focused. Within this long-term growth area, the roadways should be constructed to urban standards to provide an easier transition to traditional urban facilities as the area is developed; developments outside the designated growth area should utilize a rural cross section since it is less likely to have concentrated urban development. Objectives also include:

- Develop and distribute a questionnaire to determine how roadway improvements in rural and suburban subdivisions were being addressed in Iowa. [The questionnaire was posted on the Iowa County Engineers Association Service Bureau website and also distributed to the County Zoning Administrators through their website.] A total of 36 responses were received and can be summarized: the "typical" county does not require paving of the connecting road but does require paving of the roads within a subdivision. Only one county responded that they have established warrants for the paving of the connecting road.
- Determine uniform standards for Iowa for subdivision roadway design.
- Develop criteria for SUDAS geometric standards for rural, low-volume, low-speed roadways.

BENEFITS
- Development of rural and urban cross-sections for each classification of roadway, each set including minimum and desirable layouts for pavement width, shoulder width/material, drainage type (storm sewers, ditches and swales) and potential pedestrian/bicycle facilities.

IMPLEMENTATION
- The final report posted on:
    - CTRE website
    - County Engineers List Serve
    - County Planning/Zoning Administrators' website
- Electronic copy sent to county engineers and cities w/ population over 5000
- Present report at APWA and ICEA conferences

Q: You varied from the county engineers' instruction manual standards for local road paving and shoulder widths; is there a reason you departed from that?
A: When put to the committee it was felt that a slightly wider width would offer more support to structure than function on the outside edge.

C: These standards will be incorporated into SUDAS.

Motion to Approve by M. Nahra, 2nd by J. Krist.
Carried 12 yea, 0 nay, 0 abstaining.

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

FINAL REPORT TR-507, "Thin Maintenance Surfaces – Phase III – Municipal Streets and Low-Volume Rural Roads," Charles Jahren, Iowa State University/CTRE ($86,373)

BACKGROUND

As streets age, officials must deal with rehabilitating and reconstructing pavements to maintain a safe and comfortable ride. In light of nationwide budget shortfalls, cost-effective methods of extending pavement service life must be developed or the overall condition of street systems will continue to fall. Thin maintenance surfaces (TMSs) are a set of cost-effective preventive maintenance surfacing techniques that can be used to extend the life of bituminous pavement—pavement built with hot mix asphalt, hot mix asphalt overlays of portland cement concrete pavements, built-up seal coat (chip seal), stabilized materials, or a combination of these.

SCOPE

While previous phases of TMS research have provided information about the uses of thin maintenance surfaces in rural settings, urban areas have different road maintenance challenges that should be considered separately.

This research provides city street officials with suggestions for TMS techniques that street departments can easily test and include into their current programs. This research project facilitated the construction of TMS test sections in Cedar Rapids, Council Bluffs, and West Des Moines (all urban settings in Iowa). Test section sites and surfaces were selected to suit the needs of municipalities and were applied to roads with an array of various distresses and maintenance needs. Condition surveys of each test section were performed before construction, after construction, and after the first winter to record the amount and severity of existing distress and calculate the pavement condition index.

OBJECTIVES

- To provide street officials with suggestions for thin maintenance surface techniques that street departments can easily test and include into their current programs.

- To facilitate the construction of five test sections in three municipalities using TMSs in urban settings. Test section sites and surfaces selected will suit the needs of municipalities and were applied to roads with an array of various distresses and maintenance needs.

- To construct test sections, observe and document performance for a period of one year.

- To document construction of the test sections as well as successes, hindrances and lessons learned for inclusion in the final report and other technology transfer activities.

CONCLUSIONS

Each test section in this research stands as its own case study and should not be compared to others for the purpose of determining which surface was the most successful. The test sections stand as examples of the various preventive maintenance techniques and materials that can be used to preserve pavements. The various test sections were designed with techniques and materials that are common or available in Iowa, so that cities and counties are able to reproduce the test sections.

Because conditions of the test sections varied greatly, determining which surface was most successful by comparing case studies was not feasible; however, general conclusions can be made from this research:

TMSs are suitable preventive maintenance techniques for a municipal street department's program for preserving existing pavements. Careful attention should be paid to proper planning, quality control during construction, aggregate and binder selection, and aggregate embedment in order to support successful TMS application. A description of the construction process for each of the test sections is included in the final report.

IMPLEMENTATION

- A decision matrix and Thin Maintenance Surface handbook for the use of thin maintenance surface treatments is immediately available. As part of a preventive maintenance system, TMSs can help spread out the workload and decrease the amount of rehabilitation and reconstruction necessary to maintain a street system in good condition.

- The TMS decision matrix, generalized in a table in the final report, facilitates informed decisions about preventive maintenance strategies.

- Since the test sections were designed with techniques and materials common or available in Iowa, other Iowa cities and counties should be able to reproduce the results of the test sections to a large degree when conditions are similar.

Q: Did you find with your chip mat the contractor had experience with that?
A: The city of Cedar Rapids did this and it was done in an hour or two; the fabric was rolled out and the process was standard. This was close to the US30 & I-380 intersection.

C: We found that with pea-rock, it works better on roads that are built up; we found crushed limestone works the best.

C: The handbook looks excellent; it should get a lot of use in the future.

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

PROPOSAL
Sole Source Proposal IHRB 07-05, *Evaluation of Rumble Stripes on Low Volume Rural Roads in Iowa*, Shauna Hallmark, Iowa State University ($53,807)

BACKGROUND
Single vehicle, run-off-road are the most common type of crash occurring on rural roads in Iowa. Considerable research has been dedicated to reducing the incidence and severity of this type of crash. Rumble strips placed along a parallel paved shoulder have been proven effective in some studies and the value of good quality pavement edge markings for driver guidance has been commonly accepted for many years.

Rumble stripes are a relatively new innovation that combine the beneficial effects of edge lines and rumble strips while enhancing the longevity and wet condition visibility of painted markings. With rumble stripes, the edge line paint markings are applied directly over the rumble strip indentations, resulting in a near-vertical painted face for much improved wet condition visibility.

SCOPE
Several design options will be considered for rumble strip installation including variable, but narrow widths, depths, and configurations. Design details from the Iowa DOT and other states will be reviewed for application. In addition, rumble strips will be installed in both Portland Cement Concrete and Asphalt Cement Concrete roadways, if available for study. Multiple design options and pavement types will provide a broader scope of evaluation and better approximation of installation costs for all pavement types.

OBJECTIVES
This project will provide an opportunity to study two topics of major interest to county engineers:

- Improved safety on paved rural roads

- Enhanced performance of painted edge lines, especially in wet weather

Also, objectives of this project are to investigate the economic and physical feasibility of installing narrow rumble strips along the edge of selected paved secondary roads in Iowa. A painted edge line will be placed directly over the rumble strips, thus providing anticipated improved longevity and wet weather visibility of the paint. Evaluation of reduced run-off and drift-off crashes will be undertaken as well as enhanced performance of the painted edge lines.

BENEFITS
Iowa counties in particular will benefit from this research by obtaining another tool for improving rural roads safety and extending the effective life and wet weather visibility of painted edge lines. With expanded use of this technique, installation costs should be reduced and more common use of rumble stripes may occur. Narrow width installation may also provide more options to the Iowa DOT for future rumble strip installation on the primary road system.

IMMPLEMENTATION
The research findings will be contained in final report with printed copies of the report distributed to counties, cities, interested Iowa DOT offices, and national transportation research libraries. PDF files of the report will also be made available to any interested individuals or organizations through the IHRB and CTRE websites.

The interim and final reports will be publicized through news releases and articles in such publications as CTRE's *Technology News*. Evaluation results will also be presented in workshops and conferences such as those conducted by the Iowa County Engineers Association and Local Technical Assistance Program.

Q: You said this would be about 4"-6" wide; were you going to use the same skip pattern with the stripes as used the edge-line strips?
A: Each location will be examined individually; we may do some that way and some not. We do have a high number of bicycles using that route so that may be a consideration.

Q: Is there experience with this 4"-6" wide line?
A: Not that I'm aware of; MO uses a relatively narrow one but it's more like 12".

Q: Is there an aspect of this that will give us some feedback on the effectiveness of that width as far as sound?
A: That's one of the evaluations needed to be done; I'm not sure what equipment could be used. A sound meter could be used in a vehicle.
C: The human performance lab at University of Iowa (Tom Schnell) has equipment that they use for testing rumble stripes and strips.

Q: That's a huge change from 12"-16" to 4"-6". There's a lot of focus on reflectivity but what about the stripes rumble?
A: It's critical we use a narrow width on county roads because most don't have paved shoulders.

C: The budget is lean; the majority of funding is for installation.
A: We have funding from other sources; the total funding is over $100,000. We can basically do 17 lane miles at $2000/mile; we have additional funding.

Q: Will effects from semi traffic and larger vehicles be examined?
A: It depends on the traffic on some of these roads. On the roads we looked at there isn't a lot of commercial traffic.

Q: Are they causing drivers to cross the center line and causing accidents? In your data collection of accidents, are you looking at other accidents that may have increased because of this?

A: We could do that; many existing studies have examined that. The evaluation of shy distance will reveal if drivers are moving closer to the center line and getting farther away from the edge line. We're looking primarily at curves and if vehicles are dropping off the edge line.

Q: You're just looking at curves?
A: It depends on the crash analysis. We want to place the stripes where they have the most probability of success.

C: If stripes are placed right on the edge there is no recovery; once drivers are on this they're on the shoulder. Stripes may be most effective where there is 3' of recovery; but if you do that in my county, people actually avoid it by driving over it.
A: We may very well find that stripes are impractical with narrow roads.

C: The state's going to white stripe all the rumbles they just put in on Hwy 30.
A: If they're close enough to the driving surface; some are quite a distance from the driving surface.
C: When we're striping, we're striping at 11'.
A: One benefit is the visibility as longevity of the paint marking; the tactile and audible aspects are valuable but the key aspect is the physical.
C: Obviously they don't have much value in snow.
A: For snow that's very likely; some of the video I've seen has shown rumble stripes making a difference.

C: Other money is also being put into this project.

Motion to Approve by M. Nahra, 2nd by T. Fonkert.
Carried 13 yea, 0 nay, 0 abstaining.

Proposal – *Development of Mix Design Process for Cold In-Place Recycling Using Emulsion – Phase III*, Hosin "David" Lee, The University of Iowa/CEE ($60,666)

BACKGROUND
Phases I & II of the research developed and validated the mix design procedure for Cold In-place Recycling using foamed asphalt (CIR-foam). It was also demonstrated that the field performance of various CIR-foam mixtures could be predicted based on the test results from newly purchased performance testing equipment. This initial material performance testing shows that CIR dynamic response may be significantly impacted by asphalt stabilizer content and age of the RAP binder. PHASE 3 is proposed to develop a new mix design process for CIR-emulsion by applying the know-how gained and equipment purchased during the Phase 2.

SCOPE
This research proposal would examine the existing CIR-foam mix design process with commonly available equipment that may give similar results for the CIR-emulsion mixtures. The potential benefit of this study is a better understanding of CIR-emulsion material properties in comparison with CIR-foam material properties that will allow for the selection of the most appropriate CIR technology and the type and amount of the optimum stabilization material.

OBJECTIVES
PHASE III - This research will examine the existing CIR-foam mix design process with commonly available equipment that may give similar results to the current CIR-foam mix design protocol.

Tasks

- Task A – Collect RAP materials from two different sources for testing both standard and engineered emulsions.

- Task B – Evaluate RAP materials in terms of asphalt content and stiffness, RAP gradation, RAP elongation and flatness ratio.

- Task C – Examine compaction characteristics of RAP materials using both a gyratory compactor and a Marshall hammer.

- Task D - CIR-foam mix design process (indirect tensile test applied on wet samples using gyratory compactor and Marshall Hammer) will be applied to CIR-emulsion mixtures with varying emulsion contents.

- Task E - Performance tests such as dynamic modulus test, static/dynamic creep test, and raveling test will be performed on CIR-emulsion specimens.

IMPLEMENTATION
The implementation outlook for this research effort is very pragmatic given a number of planned construction projects of CIR pavements using emulsion in Iowa. The results of this PHASE III study shall provide a mix design process for CIR-emulsion which can be implemented as part of the DOT specification DS-01076. A demonstration CIR-emulsion project, which would follow a new mix design process for CIR-emulsion developed during this PHASE III study, is also expected to come out of the proposed study for implementation.

C: Emulsion is different depending on the vendor.
A: That is a problem in the industry; specs are not clear. Hopefully, some of these issues can be addressed in our study.

Q: How do you know what emulsion mix you get?
A: That's a good question.
A: There are some ASHTO specifications for emulsion; like the older asphalt binder specifications they are very broad. There are efforts to find essentials of base asphalt in these components. It won't be difficult to take a sample of the emulsion and check to see if it meets current specifications. There's no advantage to the emulsion supplier to give Dr. Lee what is in the tank; it's a matter of making sure the supplier is putting together a CSS1.

C: We can tell if there's a wide variation between the mixtures.

Motion to Approve by S. Gannon, 2nd by J. Rasmussen.
Carried 13 yea, 0 nay, 0 abstaining.

NEW BUSINESS

Dr. Keri Hornbuckle, The University of Iowa, is the University's new representative on the Board and newly appointed department chair; she will attend the September, 2007 meeting.

Q: Where are we on the fulfillment of solicitation from spring?
A: The Rumble Stripes proposal presented today was from that solicitation; the RFPs that went out in July will be due in September, and the second round of RFPs put together in October 2007.

Discussion of previously tabled proposal *Effects of Pre-Wetting and Anti-Icing Brine on the Performance of Cracked Bridge Decks*, Faoud Fanous, Iowa State University ($240,410), June, 2007

C: In yesterday's *Des Moines Registe*r there was a story about the National Transportation Safety Board (NTSB) that discussed the issue of anti-icing in light of the I-35 bridge failure; it's not pin-pointing that as the cause whatsoever, but it is simply stating that it is one item they're going to examine. There are concerns that application of potassium acetate that was used there may have caused corrosion of zinc plating materials.

What professor Fanous intended to study was percolation rates and/or migration rates through the concrete to reach rebars imbedded within the concrete; but Mark Dunn brings up a good point that it is an extreme complication to the project that there isn't good data for the project on application rates, frequency, etc. so it's difficult to apply scientific knowledge that can be linked back to the compounds applied.

C: We discussed this after the county engineering meeting last fall after a presentation for the county engineers as part of the annual meeting in Des Moines; at the time, professor Fanous was following up with a summary of chlorides penetrating the deck and getting down into the reinforcing steel from standard spreading of salt in de-icing in contrast to anti-icing (pre-treatment).

What I was looking at was application liquid brine on the deck accelerating chloride penetration into the steel on the deck. For counties who haven't made the decision to do anti-icing at this point in time, I thought it may be some data to look at . .deciding whether or not it was worth looking at. I've seen mixed results on anti-icing in watching county roads right next to IA DOT roads right next to city of Manchester roads where both the city and the state are doing a good deal of anti-icing and we're doing none. Again, I thought there was some value in looking at this.

C: This proposal came in as a subsequent phase to previous research…the project would be a continuation of Phase II research; the submitted proposal was for Phase III.

C: One of the biggest questions we had was looking at a field study where there are really no records available regarding what materials have been put on at what rate, at any point through the life of these structures, and trying to determine how much damage is related to each one of those. . . I don't know how we can get there effectively. For a budget of $250,000 there are a lot of question marks on what data we even have available; for instance, outside the salt usage for a district in a year's time (which doesn't tell you where it went or what rates or how many snowfall events you had or anything like that). . . .it would be difficult to find the information that we are seeking.

We thought it might be better to set this up as a laboratory investigation to look at different application methods of salt, rather than trying to go out and do coring in the field to numerous structures; it would be an extensive coring operation in order to come up with enough samples in order to answer these questions.

C: I'm not sure that testing hasn't already been done.

C: It's possible that lab testing has been done.

C: Why don't we ask professor Fanous to do a literature survey in order to find out what lab testing has been done along these lines and he could report back to us on that; I agree on the inability to connect field testing with application rates? It puts a big barrier on this research.

C: Was he looking at more than just the salt-brine issue or was he looking at other products?

C: I think he was only looking at brine vs. salt. The majority of it was something he'd looked at before.

C: If it was an IA DOT bridge you could determine if the state had started doing anti-icing on that bridge; the question of 'do we do this or don't we?' could be answered. The comparison of bridges which receive the treatment with those which don't could be made. That type of investigation would require a little less rigorous testing and would be more a matter of anti-icing application effects.

C: When I was in IA DOT in District 4 every time the truck left the shop they were using anti-icing, whether it was 40° or 20° they were spreading it 3-5 times a day; so how would you know how much was being put on a bridge?

C: There's a big difference between anti-icing and de-icing; we anti-ice when we think we're going to get a snow storm. But that's like 40 gallons a mile so it's a very minimal amount. De-icing is putting rock salt right on the bridge (pre-wet) so it's perhaps 20-50 times the strength of anti-icing; the anti-icing is really not very much salt at all. It also depends on the winter and the salt you get . . and the conditions of how much water was there and how much salt actually sits on the bridge. So the de-icing has a greater impact than anti-icing.

You could look at the corrosion on state roads where we've been anti-icing for 15 years and compare it to a bridge that's never had salt put on it, but all you end up with is the corrosion the salt causes, but won't be able to distinguish the difference between anti-icing and de-icing.

C: Once de-icing is used, the road turns into a dust cloud of salt as it dries out; it's de-icing that will kill your bridges, but this proposed study is more anecdotal rigorous. I don't know how you'd ever examine this in a rigorous scientific study. You could study chloride ion numbers as you go down through the deck, but I agree that the laboratory will tell you as much about that as anything else, which is actually the problem. You know the effect if you get the chloride ions down on the rebar.

NOTE: A request to deliver verbatim notes on this discussion to professor Fanous was made by Chairman James Alleman in order that a written response can be presented to the Board regarding the scope of this proposed study.

C: There's also the issue of high density overlays on bridges vs. a regular bridge deck and corrosion effects.

C: They anti-ice on a routine basis, whether there's a storm coming or not.

C: Or even de-icing; they just go out and you still won't know how much salt is applied on the deck; on some bridges in southern Iowa the water sits on the deck with a concentration of brine for days and more is still spread on it.

C: The policy is that we will anti-ice for frost; we will also anti-ice if we're expecting a storm.

C: Once engaged in de-icing you can't quit; you don't want to be the one who causes the road to be slick. In my opinion, that's what causes most of the harm. Blowing snow is what kills you; you have to go back out and do it again for wet roads.

C: Mark (Nahra), could you and Fouad Fanous discuss this further?

A: We could look at it but I think there's been some feedback here; I'd be willing to but think Will Zitterich should be in on that discussion as well; someone from IA DOT.

No other new business was presented.

Motion to Adjourn
Motion to Adjourn by T. Fonkert. 2nd by M. Nahra.
Carried 13 yea, 0 nay, 0 abstaining.

The next scheduled meeting of the Iowa Highway Research Board will be held on **Friday, September 28, 2007 at 9:00 a.m. at the Iowa DOT Materials East/West Conference Room, Ames, Iowa.**

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Mark J. Dunn, IHRB Secretary