

IOWA HIGHWAY RESEARCH BOARD

Minutes of October 27, 2000

Regular Board Members Present

J. Adam J. George
L. Greimann R. Krauel
T. Myers J. Odgaard
D. Osipowicz L. Smithson
W. Weiss J. Witt

Alternate Board Members Present

D. Julius for T. Stoner T. Welch for D. Little
S. Andrie L. Brehm
C. Van Buskirk R. Younie

With No Representation

M. Gardner

Visitors

Larry Jesse Iowa Department of Transportation
Bob Steffes Iowa Department of Transportation
Ian MacGillivray Iowa Department of Transportation
Chen Ouyang Iowa Department of Transportation
Chris Brakke Iowa Department of Transportation
Saleem Baig Iowa Department of Transportation
Duane Smith Iowa State University - CTRE
Dale Harrington Iowa State University - CTRE
Omar Smadi Iowa State University - CTRE
Gary Thomas Iowa State University - CTRE
F. Wayne Klaiber Iowa State University
Scott Schlorholtz Iowa State University
Robert Lohnes Iowa State University
Jim Cable Iowa State University
Dean Majzoub Federal Highway Administration
Steve DeVries ICEA Service Bureau

The meeting was held at the large Materials Conference Room at the Iowa Department of Transportation, Ames, Iowa. The meeting was called to order at 9:08 A.M. by T. Myers.

Board Member

T. Myers announced that T. Stoner had triple by-pass surgery a couple weeks ago.

Approval of the Minutes

R. Krauel made a motion to accept the minutes and L. Smithson seconded the motion. It was approved by the Board with 12 yes, 0 no and 0 abstaining.

Agenda Review/Modification

None

Continuation of HR-296

Duane Smith of Iowa State University - CTRE presented a report on continuation of HR-296, "Local Technical Assistance Program (LTAP)." The objective of the Iowa LTAP is to provide technology transfer to local government transportation agencies and to aid Iowa's local agencies in implementing the results of research, such as that conducted under the direction of the IHRB and others.

The goals of the Iowa LTAP are the following:

- Continue to diversify and to deliver quality customer services
- Communicate the program's value to LTAP partners and customers
- Develop premier technology transfer network in Iowa and contribute to a national network
- Obtain sustaining and predictable funding
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The major strategies of the Iowa LTAP are the following:

- Expand and strengthen partnerships
- Deliver quality services
- Secure funding resources
- Improve LTAP recognition
- Develop and implement measurement and evaluation methods
- Integrate research with local needs

The funding request is \$91,000.

The funding is 10% Primary, 45% Secondary and 45% Street.

The cities and counties would like to see CTRE continue to raise fees on courses a little at a time. Professional classes can pay a little more than if it is a larger group of technicians attending a class.

J. Witt made a motion to accept the continuation of HR-296. R. Krauel seconded the motion and it carried with 12 yes, 0 no and 0 abstaining.

Final Report

Steve DeVries of the Iowa County Engineers Association (ICEA) Service Bureau presented a final report for TR-417, "Iowa County Engineers Association Service Bureau." The ICEA Service Bureau, created in 1998 after nearly seven years of prior effort, has now existed for 2½ years. Although assisted in starting up by a grant of \$300,000 from the Iowa Highway Research Board, it now operates exclusively on the basis of dues paid by 98 member counties. Its three person staff operates out of an office

in Des Moines, Iowa, where the 28E agency subleases space from the Iowa State Association of Counties. Services, provided via the Internet, include news & updates, communications support, files for download, on-line data base driven applications, a reference center, and a business area. Future services are being identified by both formal and informal processes and the Bureau has established itself as a valued member of the county engineering world in Iowa.

Funding was 100% Secondary.

D. Osipowicz made a motion to accept the final report. J. Witt seconded the motion and it carried with 12 yes, 0 no and 0 abstaining.

Final Report

F. Wayne Klaiber of Iowa State University presented a final report for TR-410, "Investigation of Two Bridge Alternatives for Low Volume Roads - Phase II (Volume 1 of 2)." This project continues the research sponsored by the Project Development Division of the Iowa DOT and the Iowa Highway Research Board which addressed numerous bridge problems on the Iowa secondary road system. It is a continuation (Phase 2) of project HR-382 in which two replacement alternatives (Concept 1 - Steel Beam Precast Units and Concept 2 - modification of the Benton County Beam-in-Slab Bridge (BISB) were investigated).

Work continued on both of the replacement alternatives in this study, the results of which are presented in two volumes. This volume (Volume 1) presents the results of Concept 1 - Steel Beam Precast Units, while the continued work on Concept 2 - Modification of the Beam-in-Slab Bridge is presented in Volume 2.

This project involved three major tasks during the design/fabrication/construction and testing of the replacement bridge. The first task involved documenting the fabrication of the precast double-tee (PCDT) units through photographs, slides and a video. As part of this effort, a design methodology was developed that includes the development of standard plan sheets from computer templates. The second task involved transporting the completed units to the bridge site where final construction was completed by an independent contractor. The final task involved the service load testing of the bridge at different stages in the construction process and after completion of the construction. This process was also documented through slides and video.

Based upon the construction and service load testing, the steel-beam precast unit bridge was successfully shown to be a viable low volume road bridge alternative. The construction process utilized standard methods resulting in a simple system that can be completed with a limited staff. Results from the service load tests indicated adequate strength for all legal loads. An inspection of the bridge one year after its construction revealed no change in the bridge's performance.

If you start with everything new, this bridge with new abutments is about \$112,000. You can get a precast double T unit, same length (64 ft.), \$127,000. If you go to a continuous

slab, you are going to have to get yourself intermediate support and the price would be \$136,000. It is competitive, but not as low as we wanted. Terry Wipf and I were disappointed dollar wise. Structure wise we have a good structure that is simple, but we just don't like the price. If you would use the alternate shear connector in it, we can take the price down; if you go for a shorter bridge, obviously the price comes down.

Funding was 100% Secondary.

W. Weiss made a motion to accept the final report. T. Myers seconded the motion and it carried with 10 yes, 0 no and 0 abstaining.

Final Report

S. Schlorholtz of Iowa State University presented a final report on TR-406, "Determine Initial Cause for Current Premature PCC Pavement Deterioration." A detailed investigation has been conducted on core samples taken from 17 portland cement concrete pavements located in Iowa. The goal of the investigation was to help to clarify the root cause of the premature deterioration problem that has become evident since the early 1990s. Laboratory experiments were also conducted to evaluate how cement composition, mixing time, and admixtures could have influenced the occurrence of premature deterioration. The cements used in this study were selected in an attempt to cover the main compositional parameters pertinent to the construction industry in Iowa.

The hardened air content determinations conducted during this study indicated that the pavements that exhibited premature deterioration often contained poor to marginal entrained-air void systems. In addition, petrographic studies indicated that sometimes the entrained-air void system had been marginal after mixing and placement of the pavement slab, while in other instances a marginal to adequate entrained-air void system had been filled with ettringite. The filling was most probably accelerated because of shrinkage cracking at the surface of the concrete pavements. The results of this study suggest that the durability—more specifically, the frost resistance—of the concrete pavements should be less than anticipated during the design stage of the pavements.

Construction practices played a significant role in the premature deterioration problem. The pavements that exhibited premature distress also exhibited features that suggested poor mixing and poor control of aggregate grading. Segregation was very common in the cores extracted from the pavements that exhibited premature distress. This suggests that the vibrators on the paver were used to overcome a workability problem. Entrained-air voids formed in concrete mixtures experiencing these types of problems normally tend to be extremely coarse, and hence they can easily be lost during the paving process. This tends to leave the pavement with a low air content and a poor distribution of air voids. All of these features were consistent with a premature stiffening problem that drastically influenced the ability of the contractor to place the concrete mixture. Laboratory studies conducted during this project indicated that most premature stiffening problems can be directly attributed to the portland cement used on the project. The admixtures (Class C fly ash and water reducer) tended to have only a minor influence on the premature stiffening problem when they were used at the dosage rates described in this study.

Funding was 50% Primary, 25% Secondary and 25% Street.

T. Myers - The field study, did you go back to any of the records and check the ambient temperatures at sites the day it was placed? Is there a direct effect on the ambient temperature also with this?

S. Schlorholtz - Yes, wind speed is also correlating. We have loads of records in my file on US 520, which were the first series of cores that were about 2 inches thick.

On the US 520 problem, some of the bad mixtures, what is always brought back to our attention is that we paved the previous fall and everything seemed to be going okay. In the spring it was a hot, dry, windy spring and we had concrete problems. Temperature was quite a bit hotter than it was in November when the first pavement slabs were put down. I believe chemical reactions are causing much of our problem. Chemical reactions are going to be going much slower depending on what ambient temperature is doing.

L. Greimann - Have we got something in place now to try to correct this problem?

J. Adam - We have specifications in place now on limiting the vibration, frequency for instance, These were vibrated at very high frequency, 10,000 to 12,000, it was knocking the air out. We are working on mixing time factors, but there is some industry cooperation we need there.

S. Schlorholtz - Going back to coarser cements in which the gypsum hasn't been dehydrated would be a major step, I think.

J. Adam - Better monitoring of air behind the pavers would be another one. Very simple things can do an awful lot of good here. We are working on it.

R. Steffes - Another thing that I think that should be noted is that on US 520, I think there was additional vibration done only at the joints. Maybe since 1985, we haven't done that any more. That may be why the charts show the higher air at the joints.

J. Adam made a motion to accept the final report. J. Witt seconded the motion and it carried with 11 yes, 0 no and 0 abstaining.

Old Business

T. Myers - At the last meeting we talked about Dr. Lee's proposal. Since that time there has been some more discussion by the Non-NHS Task Force. Randy Krauel is a member of that task force. Randy will give us some follow-up information on this proposal.

R. Krauel - At the IHRB request, the task force did a conference call about this proposal. We came to a consensus for the report to the IHRB. If you will recall in the modified proposal,

Dr. Lee's results of his research proposal would be a crack index, a unified crack index for each section of pavement. It did not identify the type of crack or the severity of the crack. It was the consensus of the Non-NHS Task Force that that information wouldn't be sufficient in itself for cities and counties to make their pavement management decisions on. Also, the consensus with the product of the report being a software program to analyze images, of course, images would have to be collected under some method and then this software utilized to produce the crack index that cities and counties probably wouldn't go to that extent and that is based on the fact that, historically, cities and counties haven't used formal pavement management systems, primarily because of personnel. Manpower shortages. It is also evidenced in the fact that the current system that is now being offered, the Roadware data and collection analysis through the Iowa Pavement Management Program, has had a lot of participation by cities and counties outside of just the federal aid system. That tends to tell us that pavement management is important, but it probably is one of those things that local governments will have to out source. They just don't maintain the staff for full time pavement management.

We were able to contact Salt Lake City. Dr. Lee's original research was developed for them. They were satisfied with the research and the results; they had a manpower shortage. They had quit doing a pavement management as far as automated data collection and analysis. Now they are looking at contracting it out. We think that the system in Iowa right now has been slowly and deliberately developed and has taken input from every level of government. We think that Iowa is on the right track with the pavement management program with the automated data collection and the return of data for use by the governmental agencies and think we should stay on that track for the foreseeable future. Dr. Lee has not seen this yet. I think from here that Dr. Lee will be advised of this by Mark Dunn, given a copy, and then I guess invited to either withdraw the proposal, amend the proposal or that decision would be up to him.

The board agreed that is was the proper way to handle it.

New Business

We have been given a group of proposals on topics of which the board had said they were interested in having research done. Staff comments will be provided to board members prior to the next meeting.

Preliminary project descriptions for the next phase of project proposal requests will be provided for review at the next meeting.

Date of Next Meeting

DATE OF THE NEXT MEETING WILL BE DECEMBER 7, 2000 AT 1 P.M. IN THE LARGE MATERIALS CONFERENCE ROOM AT THE IOWA DOT.