

IOWA HIGHWAY RESEARCH BOARD (IHRB)

Minutes of July 25, 2008

Regular Board Members Present

A. Abu-Hawash
J. Berger
V. Dumdei
S. Gannon

B. Moore
M. Nahra
D. Waid

Alternate Board Members Present

J.D. King for J. Waddingham
W. Zitterich for J. Adam

Members With No Representation

J. Alleman J. Krist
K. Hornbuckle J. Rasmussen
J. Joiner S. Rinehart

Secretary - Ed Engle for M. Dunn

Visitors

Sandra Larson
Mary Starr
Jim Nelson

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

Thang Phan
Shashi Nambisan

Iowa State University/CCEE
Iowa State University/CTRE

The meeting was held at the Ames Holiday Inn Conference Center, 2609 University Blvd., Ames, Iowa. The meeting was called to order at 9:00 a.m. by Vice Chairperson Jim Berger with an initial number of eight voting members/alternates at the table. One member later joined the table, bringing the voting total to nine.

Agenda

No changes were made to the Agenda.

Approval of the minutes

Motion by V. Dumdei to approve minutes from the June 27, 2008 meeting. 2nd by M. Nahra.
Carried 8 aye, 0 nay, 0 abstaining.

* One Member Joined the Table*

DRAFT Final Report: TR-556, “Feasibility Investigation of Segmentally Precast Bridge Piers for Accelerated Construction,” Matt Rouse, Iowa State University (\$89,623)

BACKGROUND

An innovative structural system for pier columns was investigated through a series of laboratory experiments. The columns and connections examined were comprised of precast concrete segments to accelerate construction. In addition, some of the columns employed elastic elements to self-center the columns against lateral loads and structural fuses to control large lateral deflections, dissipate energy, and expedite repair in the event of a catastrophic loading event.

OBJECTIVES

The objective of this research was to accelerate bridge pier construction through the use of precast columns in order to reduce construction costs, decrease traffic delays, improve work zone safety, and minimize environmental impacts. Another goal was to develop a pier system that could endure an extreme loading event such as an impact, severe wind storm, flood, blast, or earthquake better than a conventional, cast-in-place column, making the columns able to sustain large deformations, be tough and durable, and be easily repaired. Key features to this system include segmented columns with continuous unbonded post-tensioning, steel collars at the ends of segments, external reinforcement of segment joints with bolted connections, and bearing plates between segments to avoid labor-intensive grouting procedures.

CONCLUSIONS

The experiments identified both effective and unsatisfactory details for the jointed system. Two of the jointed columns demonstrated equivalent lateral strength, greater lateral stiffness, and greater lateral deformation capacity than the control column. The self-centering capability of the jointed columns was clearly demonstrated as well, and the repair technique proved effective as demonstrated by nearly identical pre- and post-repair behavior. The proposed system is a feasible alternative to conventional pier systems and recommend additional research.

Q: What if it isn't put together properly? For instance, a plate isn't set up properly?

A: This jointed design is very accessible; the first joint can be designed so it is above the grade and easily facilitates replacement.

Q: What is the comparison for cost between this system and cast-in-place?

A: If you look at the quantity of steel in this type of system, there are (in the segments because you have to have anchorages in the segments), more mass of steel in the rebar, the steel belts at the end of the segments and finally, the post-tensioning rod. All of these add steel to the system; in fact, in this case we had about 1.5 times the amount of steel in the jointed system as in a monolithic system. Since we're doing such small segments and columns, I think that for now we're expecting about a 20% increase in future projects; however, that can be offset with the speed of construction. This can be put together with a big wrench; it just snaps together.

C: We're trying to promote accelerated construction with local contractors but there are issues; they usually prefer the typical reinforced method.

A: As the project progressed the contractor we worked with gradually changed their view and became convinced that this is a valid system. At first we got the same impression.

C: We've been trying to promote accelerated construction; this may be an opportunity for us.

Q: Was LRFD considered in this study?

A: We tested to the ultimate state; however, we didn't look at the LRFD specifications for this project.

Q: How do you replace the middle section around the entire post-tensioning rod?

A: You want to protect the segments so you never have to replace an entire segment; you replace the plates that connect the segments. You never have to replace the continuous post-tensioning, the segments or the pads between the segments.

C: So if the segment is not damaged, you never have to replace it.

Q: And if the segment is damaged?

A: It depends on the damage. If you're looking at the segments, they're not match-cast, so each piece doesn't need to fit the next piece in the system. You can have some in stock if necessary.

Motion to Approve as Draft Final with Editorial Changes Pending

Motion by A. Abu-Hawash. 2nd by B. Moore.

9 aye, 0 nay, 0 abstaining.

Final Report TR-516, "Measurements of Seasonal Changes and Spatial Variation in Pavement Subgrade Support Properties," David White, Iowa State University/CTRE (\$40,000)

BACKGROUND

Seasonal variations in ground temperature and moisture content influence the load carrying capacity of pavement subgrade layers. To improve pavement performance, pavement design guidelines require knowledge of environmental factors and subgrade stiffness relationships. As part of this study, in-ground instrumentation was installed in the pavement foundation layers of a newly constructed section along US Highway 20 (US-20) near Fort Dodge, Iowa, to monitor the seasonal variations in temperature, frost depth, groundwater levels, and moisture regime.

OBJECTIVES

The main objective is to document field instrumentation results and the observed changes in soil properties due to seasonal environmental effects. The major objectives were to:

- Conduct field tests on a newly compacted subgrade to document spatial variation in stiffness parameters.
- Monitor changes in subgrade stiffness due to seasonal variation in moisture and temperature.
- Conduct field tests on the subgrade layer during freezing and thawing conditions.

CONCLUSIONS

The Clegg impact values showed that the northern lane had a higher stiffness, possibly resulting from more roller passes. Moisture content in the subbase layer remained relatively constant except during freezing periods. The subgrade moisture content was lower in the winter season compared to summer. Moisture contents of the subgrade layer increased deeper into the layer and were affected by seasonal variations. In the subgrade layer freezing penetrated downward, but thawing occurred in downward and upward directions. The PCC pavement experienced greater temperature extremes and it changed at a higher rate than the subbase and subgrade layers.

Q: Can road building techniques be used to reduce buried frost zones?

A: We can show where the possible frost zone exists.

C: I'd be interested in seeing if more crown on the shoulders doesn't have a big influence.

A: If we can show where the cross zone exists, yes, we can impact the project.

Q: What about areas like on the Avenue of the Saints near Charles City where they are constantly wet?

A: That area was investigated; there, it was a matter of having the wrong soil used. It was clay and that takes a long time to dry out. Soil selection is very important and this is a good example why.

Motion to Approve by V. Dumdei. 2nd by M. Nahra.

9 aye, 0 nay, 0 abstaining.

Final Report TR-554, "Performance Evaluation of Concrete Pavement Granular Subbase," David White, Iowa State University/CTRE (\$149,996)

BACKGROUND

Newly-built and/or reconstructed pavements require significant quantities of aggregate material for the subbase layer. Traditional use of virgin material creates a high impact economically and environmentally. At the same time, it is very expensive to deposit waste concrete material from reconstructed pavement due to the transportation and environmental expenses. Using recycled Portland cement concrete (RPCC) aggregate for road construction is currently a widely used option for subbase layers. Re-use RPCC reduces the need for natural aggregates, preserves the environment, and does not occupy landfill space; however, RPCC aggregate can reportedly experience reduced permeability, clog drainage systems, and produce a leachate with high pH that can corrode metal drainage pipes and damage vegetation.

OBJECTIVES

The main objectives of this study were to:

- Determine if RPCC pavement subbase is performing adequately by evaluating representative pavement sections with comparisons to virgin aggregate subbase sections.
- Evaluate the spatial variation in subbase stiffness and permeability by performing multiple tests within a given test section using semi non-destructive methods.
- Determine the gradation of the subbase materials.
- Evaluate the pavement drainage system at each test section site by inspecting the subdrain outlets.
- Develop suggested material guidelines and specifications for construction of pavements using RPCC aggregate for subbase as needed.

CONCLUSIONS

Specific gravities of RPCC are lower than those of crushed limestone. RPCC aggregate material varies from poorly- or well-graded sand to gravel. A modified Micro-Deval test procedure showed that abrasion losses of virgin aggregate materials were within the maximum Micro-Deval abrasion loss of 30% recommended by ASTM D6028-06. Micro-Deval abrasion loss of RPCC aggregate materials were much higher than those of virgin materials and exceeded 30% loss.

C: It's interesting to see the pavements performing similarly; the RPCC does leach. However, pavements don't seem to be performing any worse. There is a milky-type outfall from the RPCC.

A: We don't have a study to look back and track that cause-and-affect, but yes, the stiffness of the subbase does make up for other potential problems.

C: Regarding the outflow: there was only one place where we could see vegetation damage.

Motion to Approve by W. Zitterich. 2nd by D. Waid.

9 aye, 0 nay, 0 abstaining.

*** One Member Left the Table***

Discussion/Status update: R-NET, Rural Safety Information exchange Network - John Whited, Iowa DOT Research and Technology Bureau (\$100,000)

A demonstration was given for the 511 information reporting system using Google® interface online with an explanation on how the system is accessed, the standardized language (federally mandated) used and how selections are made by the transportation community (such as the highway patrol in Amber Alerts). The focus was on ease of application and benefits of the system, including audio applications which can be used with Highway Advisory Radio (HAR) and are transferred into the 511 phone system, the entry safety features and the live updates which provide instant communications and warnings to the public.

The request was for a commitment of \$100K to leverage federal funding for use in potential partnerships with other states. Funds would be used for continued advancement of program development, purchase of a server and some internet bandwidth and other elements. The goal is to include county road information for this continuing and vital transportation information interface using 911 centers, county engineers and other involved personnel.

Q: The County Engineer Service Bureau (CESB) has a notification system for road closures which any county can post on and the information is distributed through fax or email to a selected group for notification; do you envision this as something that could be tied to that? Or is this an additional product? For instance, if a county hosted a road closure and the information was sent to the sheriff's department, they in turn could post this information? How do you see this working?

A: You just described one way that can happen: Information is populated into many formats after being entered just one time into the system. The county system probably has some of the characteristics of the 511 system.

We do have Desk CARS Messenger that is an internal alert that transmits the faxes and pages, so other notification sources are unnecessary. This system, however, is tailor made for use with the Google interface; the relationship between county road personnel and the sheriff's department or 911 center is the key thing we want to connect with.

Q: Certain personnel and groups will be allowed to post on this?

A: Again, this is a pilot, and there may be some things we look back on and want to change after our experience of how things work out; some things may need to be changed for full deployment.

Q: Currently, who is posting items online for the state?

A: The Iowa DOT field offices and state highway patrol post items now. Counties could add another layer of information for local roads and primary and interstate systems as well, which is why we're excited about having more eyes and ears reporting out there. In addition, there is potential for the Operations Center to post items 24/7 starting in November. The idea is that more people working in coordination with a common product brings more accurate and updated benefits and information.

Q: Why not offer it to the E911 dispatch for every county?

A: Yes, that's what this includes; but it's up to us to partner with them. It's our responsibility to be part of that involvement to keep people informed.

Q: Are you saying you want us to explore linking to what the Service Bureau currently has in its system?

A: Yes. That seems the most likely way to be successful. We're already giving the data to the Service Bureau.

C: One concern is that if access is given to just the E911, if they identify a problem out there (they get a call to dispatch) and they post it, there may not be verification or there could be miscommunication.

A: This system will set up permissions and the way information is conveyed and by whom. Before it gets posted on the web site, the message would go to you and you could verify it. That's why you don't want just one entity to have authority. Eventually this will include a working relationship with all the folks who work on our roads, and some of this information doesn't even need to get to the public.

C: For a longer lasting partnership, going through the Service Bureau would be important.

C: You can help define who will put what information in and when—seeing it is easier than trying to describe it over the phone. These updates are coming in 24/7, not just during work hours. This is a way to have good dialogue and changes made so people have reliable information to act on.

C: This presentation was made just to see if there was interest in considering this; we do not want to push this on you [the Board], but wanted you to be aware of what we're [IA DOT] doing.

C: This certainly seems like a deployable product. It would be nice if we had a way to link to it with the system we're already using; notification either to the Service Bureau or log into this system directly and replace what's on the Service Bureau. We could begin talking with Steve DeVries of the Service Bureau regarding this.

C: But only a county engineer can add a closure, right? It will be verifiable?

C: The public can look at the Service Bureau site but they are only guests and have limited access; county personnel can add information.

C: If it was possible to link to the Service Bureau that would be beneficial.

C: The system in place now goes something like this: Dispatch gets a call after-hours that a tree is down; they call us. Our staff makes a decision to close the road. We call dispatch back or send them a fax showing them the location of the closed road. But with the new system, they could enter the information on the state-wide map; we wouldn't necessarily need to have the Service Bureau involved. Dispatch wouldn't update items until we told them to.

Q: With our current 511 map (or with the map being developed using a module coming up in CARS local), does it show all the county roads?

A: It will show whatever Google shows. There is a lag in translation so some county roads may be labeled incorrectly; however, that is one reason we went with Google because with it, we can go back and make updates and changes. County engineers can go in and zoom in to where issues are and then put the location in the way you want it, the way people know and understand it. So descriptions are a lot more accurate. Yes, the map is a Google map with our information overlaid on top of it.

Sandra Larson: It sounds like you're interested but would like more information, correct?

C: Yes, Steve DeVries should have that conversation with the Iowa DOT.

Q: But is there enough interest from the counties in this for us to pursue conversations with Steve?

A: It would probably be best to go through the ICEA Computer Committee, which is the committee that directs Steve.

C: Dan Waid is on that committee.

John: If you'd like me to attend that meeting, please let me know. Meanwhile, I'll tell Idaho that we've got some interest but that we're still working through the details.

C: I don't doubt there's interest; however, when there's money involved, it's a different thing.

A: We wanted you to know what's out there.

C: We can get more information on what's possible and what costs there might be.

No Action Was Taken

NEW BUSINESS

Ed: The Travel Meeting is scheduled for September 4-5, 2008. On Thursday afternoon (we're still making arrangements but it looks very good) we'll be visiting the I-35W reconstruction site in the Twin Cities and then, on Friday morning we'll be visiting MnROAD to look at the Heavy Agricultural Loads project that the IHRB is supporting and some of the other research being done there. There will not be an official meeting. There are rooms blocked at two hotels in the area (you'll need to make your own reservations).

ADJOURN

Motion to Adjourn

Motion by V. Dumdei. 2nd by M. Nahra.

Motion carried with 8 aye, 0 nay, 0 abstaining.

The September 2008 meeting of the Iowa Highway Research Board will be held **FRIDAY, September 26, 2008 at 9:00 a.m. at the Ames Holiday Inn Conference Center, 2609 University Avenue, Ames, Iowa.**