State-Aid Bridge News

December 29, 2007

- **Local Bridge Scanning Tour Update**

We're excited to report our findings of the successful tour of several counties in Washington State. Dave Conkel of State Aid Bridge will be presenting the results of the Washington State local bridge scanning tour at the 2008 Minnesota County Engineers Winter Conference. The power point presentation will eventually be posted on the State Aid Bridge Website, along with other tour update information. Until then please contact Dave Conkel if you would like an e-copy of this presentation.

The tour of Washington State took place at the end of June 2007. We visited the eastern and northwestern parts of the state. Locations included the City of Spokane, Adams County, Grant County, and Whatcom County. Types of bridges the team scanned included, voided slab, tri-deck, deck bulb tees, super girders, and post-tensioned spliced concrete girders.

Other unique findings included bridges with integral wearing surfaces, precast concrete grade beams, and galvanized stay-in-place pile cap forms. General recommendations from the scanning team include the consideration and use of additional prestressed concrete beam options and possibly greater use of post-tensioned concrete products.

As we pull together our findings and conclusions from both New York and Washington State, the team will be planning a short one to two day trip to Iowa and/or another Midwestern state to scan their local bridge system.

Implementation efforts continue, as we see the final plans completed and ready for letting of the side by side prestressed concrete box beam bridge supported on sheet pile abutments for Blue Earth County. The team will also be developing a marketing plan to further implement these proven bridge technologies across the state of Minnesota to bring economy, speed of construction, durability, and efficiency to the local bridge system.

The members of the Local Bridge Scanning Tour Team are Dave Conkel (State Aid Bridge Engineer), Patti Loken (State Aid Programs Engineer), Romeo Garcia (Minnesota FHWA Bridge Engineer), Alan Forsberg (Blue Earth County Engineer), Gary Bruggeman (Steele County Engineer), Rich Sanders (Polk County Engineer), Ron Benson (Erickson Engineering), Larry Erickson (SRF Consulting Group) and Kent Rohr & Jeff Rensch (WSN), and our New York partners Earl Dubin (NY/FHWA), and Bill Fox (Cattaraugus County).

- **Bridge Hydraulic News & Bridge Tool Update**

The newest version of HY8 (culvert design software) is available for free download from: http://www.fhwa.dot.gov/engineering/hydraulics/software/hy8/quick.cfm . We highly recommend it!! It is a tremendous improvement over the older version of HY8. If you have any questions about operating the program, please contact Petra DeWall at 651-366-4473

Petra is currently on a NCHRP Panel to develop design criteria for instream structures. These structures are used to stabilize and restore streams and rivers. Stream restoration is currently more of an art than a science and relies heavily on a prescribed design approach rather than hydraulic engineering principles. We have just awarded the contract to St. Anthony Falls Hydraulic Lab at the U of M to study these structure types and produce a guidance document about the proper use of in-stream structures. This is a 3 year project, so we will keep you posted as to the progress.

The Bridge Tool consists of an online mapping application that will allow local agencies and local agency engineers to access bridge information on a map. The user can view all bridge locations by scour code, NBI deck rating, ADT, deficient status, posted bridges, or traffic railing condition. Also one can access more detailed bridge information such as the Pontis reports, hydraulic data, and etc. by simply toggling on the plotted bridge locations. The development phase of the project is near completion. We are hoping to have it wrapped up by the end of the year. We will be starting the testing phase and moving into the training early next year. If you have any questions, please contact Petra DeWall at 651-366-4473.

- **Bridge Rating Class 101 for County Engineers**

The workshop will cover rating procedures, discussing the applied loads and the capacity of distressed members. There will be rating example problems and class exercises to help you gain the necessary knowledge to assess whether or not an existing simple span local bridge can tolerate additional dead weight from a proposed overlay, etc... The workshop will discuss important information related to posting, and permitting bridges. Legal loads, special hauling vehicles, and posting rules will also be discussed!

The workshop will allow time for discussing common mistakes when rating and posting bridges, and offer ample time to take questions and comments for discussion and answer, and take requests for possible follow up materials.

The class participant will also go home with worked out rating examples and other valuable reference materials.

Who should attend? The class is designed for the County Engineers and their assistants interested in learning the basics of local bridge rating and posting. Interested City Engineers and their assistants are also welcomed. So leave your calendars open for the date and convenient location listed below. Sign up early, class size is limited to 50 participants. Your attendance is appreciated.

Class Locations and Times:

- Duluth, March 26th, 2008
- Bemidji, March 27th, 2008
- St Cloud, March 4th, 2008
- Marshall, March 5th, 2008
- Owatonna, March 13th, 2008

(All classes will run from 9:00 am to 3:30 pm)
(Lunch included)

- **Bridge Management Update**

A CD containing bridge inspection data was mailed in July to local agencies with more than 10 bridges. Follow the instructions on the CD to install the latest agency data. When all inspections have been entered, the data should be sent to Lisa Hartfiel in the Mn/DOT Bridge Office no later than February 15, 2008. If you will not be able to meet the deadline, please contact Lisa Hartfiel to make arrangements. Those agencies with 10 or less bridges should mail or fax a copy of their completed inspections with markups to Lisa Hartfiel.

Once you have completed all inspections and the inspection data has been submitted to the Bridge Office and entered into the database, the report “BRIDGE INSPECTION REPORT MULTIPLE” (located on the bridge office website), can be run to print all of the completed inspection reports for your bridge files. This report should be run before April 1, 2008. Local agencies are required to have a signed inspection report for each bridge in their files.

Please be patient with us. We are behind in entering new bridges into Pontis. When new bridges are entered, we will notify the bridge owner that they are available online.

If you have any questions regarding bridge inspection, contact Lisa Hartfiel at 651-366-4557 or Jim Pierce at 651-366-4555

- **20’ Span Precast Concrete Culverts**

Representatives from the Bridge Office, State Aid Office, FHWA and State Aid Bridge met with several local precasters to discuss the introduction and implementation of the 20’ span precast concrete culvert for Minnesota. Representatives from Hancock, Hanson, and Cretex were available to discuss the possibilities.

Several of our Minnesota county engineers believe the 20’ span culvert would be worth considering in those areas subject to heavy debris, and/or ice. Some county engineers alluded to other advantages such as ease of construction and quicker installation than a multiple line culvert system. Several counties in the southeastern region of the state have expressed a desire and interest in the large span precast concrete culvert.

The feedback we received from the precasters was positive. They all appeared to have the forming capability to achieve a 20’ maximum span. Hanson had a contractor price out two lines of 10’x 10’ culverts versus a one line 20’ x 10’ culvert. The result suggested that the 20’ x 10’culvert would be slightly cheaper with a savings in material.

The precasters also said they like using the Mn/DOT standard culvert design charts and details. We indicated that Mn/DOT is currently developing design charts and standards up to a 16’ span. If the demand for 20’ spans becomes a reality, Mn/DOT will consider culvert standards up to 20’ maximum spans. Until design charts and standards are developed for the 20’ span, the State Aid Bridge Unit will assist the local’s consultant and/or precaster with design as requested.

There are special considerations when specifying a 20’ span culvert. Trucking, handling, and coordination will require more upfront planning. Special truck permitting will be necessary. The owner must also make sure the 20’span culvert sections can be delivered and erected at the proposed site, IE. adequate road access, adequate staging, storage and erection areas.

The local’s consultant can propose a 20’ span culvert at the request of the local agency. The request for a 20’ span culvert would be based on the project site, debris/ice potential, DNR requirements, speed of construction and etc….

- **Local Bridge Replacement Program Update**

As we come to a close of 2007 and begin 2008, we will be anxiously anticipating a new bonding bill to include bridge bonds for the next biennium. There is considerable support being generated for the legislature to approve a significant dollar amount for the local bridge program.

The 2006 bridge bond appropriation of $52.5 million is spent or accounted for and all new projects with approved plans are currently being placed on a waiting list. The waiting list for bridge funding currently has over 60 projects requesting a total of $16 million in bond or town bridge funding. It’s important to submit any of your projects completed to make sure the waiting list accurately reflects the need for bridge funding.

Mn/DOT’s local bridge funding request to the governor’s office for the 08/09 biennium is $70 million. The Local Bridge Master Priority List compiled by the SALT office demonstrates the local agencies have identified over 900 bridges for the biennium as a priority for replacement at a total cost of $355 million. These bridges are requesting $137 million of bridge bonds and $52.7 million in town bridge funding. All county or city engineers who have not yet updated your 5-year bridge replacement priority are requested to send a resolution identifying the bridges for replacement to Patti Loken, State Aid Programs Engineer. This information is used by the State Aid office and used to demonstrate to the legislature the need for appropriating bonding to the local bridge replacement.

- **Major or Unique Local Bridges of 2007:**

Sauk Rapids Regional Bridge (CSAH 1) Over the Mississippi River

The official dedication and ribbon-cutting ceremony took place on November 16, 2007. The bridge replaced the former Sauk Rapids Bridge, located a short distance downriver. The bridge has a total length of approximately 1,300 feet. The new span relied heavily on steel girders for its construction rather than concrete girders to reduce the number of piers needed to be placed in the river. It was designed by engineering consulting-firm SRF Consulting Group. Construction of the bridge cost an estimated $20 million.

Midtown Greenway Cable Stayed Pedestrian Bridge over Hiawatha Avenue

The official dedication and ribbon-cutting ceremony took place on November 8, 2007. The bridge has a total length of 2,200 feet with the main span over Hiawatha at 220 feet. The height of the single tower from where the cables are suspended from is about 100 feet. This is the first true cable stayed bridge in the State of Minnesota. It was designed by engineering consulting-firm URS. Construction of the bridge cost an estimated $3.5 million.

Lowry Ave Bridge Replacement, CSAH 153 over the Mississippi:

The existing Lowry Avenue Bridge is a Twin Cities landmark bridge that spans the Mississippi River. It is notable in that it has a steel grid deck that drains directly through the mesh, as opposed to the more common concrete deck. The bridge is a multiple span high truss with a total bridge length of approximately 890 feet.

During repainting in 2004, engineers discovered unexpected movement of a pier. Since then, Hennepin County has continually monitored the bridge to ensure its stability. With indicators of a declining bridge structure, the need for replacement was identified. The current structural status of the bridge makes it eligible for both federal and state bridge replacement funds.

Currently, Hennepin County is engaged in the bridge type study and process comprised of public involvement and engineering tasks. The public process, which started in 2007 is expected to carry into 2009. The bridge type will be selected in early 2008. The selection process appears to have identified three bridge types for the replacement bridge. The bridge types include a cable stayed, basket handle arch, or a post-tensioned concrete box girder bridge. It is hoped that the project will be let sometime in early summer of 2009, with construction starting shortly after.

- **Treated Wood Task Force**

The environmental office of Mn/DOT has assembled several interested Mn/DOT groups such as state aid bridge, district maintenance, bridge office and etc…. to serve on this important task force.

The objective of the task force is to determine the current treated wood needs and what type of products can meet those needs for Mn/DOT and our customers. Ultimately, the information from the task force will be used to revise the Mn/DOT specification language and the approved products list. To date, Mn/DOT's approved wood preservatives include creosote, penta, and envirosafe plus (a borate product with polymer binder for exterior use).

The task force will work with the environmental office and industry to expand the list of approved products for our customers. New products will be considered such as Wolmanized L^3, a non-metallic carbon based preservative, or MCQ, micronized copper quaternary, same basic ingredients as ACQ but unlike ACQ it is non corrosive in contact with metal.

- **In-Depth Inspection of Fracture Critical Bridges**

An updated Mn/DOT technical memorandum on the guidelines for in-depth inspection (members inspected from an arms reach) of fracture critical bridges will soon be released for compliance.

The update will now require in-depth inspections at intervals not to exceed 24 months of non redundant bridge members that are determined to be fracture critical. The purpose of this update is to ensure the safety of bridges with fracture critical members in accordance and compliance with federal regulation (National Bridge Inspection Standards, Title-23, Code of Federal Regulation, Part 650)

Note, a fracture critical bridge is a bridge that is not load path redundant and that has at least one fracture critical member. Fracture critical members are steel tension members whose failure would be expected to result in collapse of the bridge.

In-depth inspections of fracture critical bridges will remain the responsibility of the Bridge Office. Scheduling priority for in-depth inspections will be given to large and complex bridges. The State Aid Office has programmed the necessary special funding to sustain the required 24 month in-depth fracture critical inspection frequency.

Note, local agencies are still responsible to perform annual routine inspections (note, routine inspections include inspection of fracture critical and other non redundant members) of non redundant bridges to comply with current state law. Also, local agencies remain responsible to perform in-depth inspections at intervals not to exceed 5 years of non redundant bridge members.

Please look for this new updated technical memorandum. Any questions regarding the technical memorandum and in-depth inspection requirements can be directed to Todd Niemann, State Bridge Inspection Engineer at 651-366-4567.

- **Flexural Vibration Inspection of Timber Bridges.**

The University of Minnesota Duluth Natural Resources Research Institute (NRRI) in partnership with the Local Road Research Board, USDA Forest Products Laboratory, FHWA, St. Louis County, and Wheeler Lumber has developed a non destructive inspection method using forced vibration techniques to assess the structural condition of simple span timber bridges.

The inspection method relates the vibration characteristics of the timber bridge to measure structural integrity. The testing method uses an electric motor with a rotating unbalanced wheel to excite the timber span, and accelerometers to record the response. The measured bridge, motor, and vibration parameters are used to calculate the stiffness of the timber span. If timber rot, decay or overload is present the dynamic behavior and resulting stiffness will be affected.

The NRRI has used flexural vibration testing on several dowel laminated timber decks for St. Louis County, an experimental nail laminated bridge deck system at the NRRI, and scheduled to test a Wheeler timber bridge during fabrication, installation and in service. This inspection method appears to be a reliable way to assess the existing condition of timber spans which will allow us to make rational rehabilitation, repair, or replacement decisions.

The NRRI is also excellent resource for other timber inspection techniques such as resistance drilling, stress wave timing, and moisture content measurement, contact Brian Brashaw 218-720-4248.

- **Interstate 35W Bridge - Rebuild**

Construction updates on the rebuilding of the I-35W Mississippi River Crossing along with other interesting facts about this new bridge structure are available online at http://www.dot.state.mn.us/i35wbridge/rebuild/.

Flatiron Constructors of Colorado, has pledged to finish the bridge in 437 days -- major work on the I-35W Bridge started the week of October 29th. The plan is to finish the $234 million bridge rebuild project by Christmas 2008.

The new bridge will be twin 4 span 330'-504'-242'-147' concrete box girder bridges with 25' to 11' variable depth. The width of each bridge will be 90'-4", striped for five lanes each direction with 13' and 14' shoulders. Future lane configuration could be four lanes each direction plus light rail or a bus transit lane.

Some bridge safety enhancements include geometric improvements to eliminate sub standard roadway geometry. High performance concrete with prestressing for superior durability, a 100 year bridge!

Also the bridge has multiple levels of redundancy. It has two bridges, each with two box girders, hundreds of high strength steel strands embedded in each box girder, and a pier under each box girder

The 35W traffic restoration projects in the area were successful in managing traffic congestion. Evening congestion impacts remain relatively unchanged. However, the area has experienced heavier traffic congestion this winter.

- **AASHTO LRFD Bridge Design Work Shop**

On June, 12th, 2007, State Aid Bridge participated with the Bridge Office in conducting a one day LRFD bridge design work shop for our local agency engineers, local bridge engineers, and trunk highway bridge engineers. The workshop covered LRFD loads, and load combinations, foundations, abutments, walls, piers, standards issues, and load rating issues.

State Aid Bridge presented materials on the design and construction of integral and semi integral abutments and new approach panel details. The workshop stimulated several good questions and discussions regarding LRFD bridge design. A follow up question and answer sheet was developed and distributed to class participants.

To date, all of our local bridge consultants are in compliance with LRFD specifications. Also, local bridge foundations are now being designed in LRFD format as we continue to educate and develop criteria for our local geotechs and engineers. Over the next several years LRFR, Load Resistance Factor Rating, along with LRFD of culverts, retaining walls, and other secondary structures will be addressed.

- **Emergency State Wide Inspection Update**

The local agencies and Mn/DOT Districts have done an outstanding job of completing inspections and reporting progress. The Governor directed Mn/DOT to inspect all Trunk Highway bridges this year. We will have all of the field work completed by the end of December 2007. As of today, we have inspected more than 3750 of 3900 trunk highway bridges. The workload was almost double our normal annual inspection program. Hands-on/in-depth inspections were performed on all local and trunk highway bridges classified as fracture critical and those that have pins and hangers. Daily reports were published as to the statewide inspection progress including daily updates on local progress on completing inspection of bridges classified as structurally deficient.

Some of this work was performed under an emergency consultant contract with PB Americas, Inc. Their role has been to supplement our fracture critical inspection personnel and equipment and assist with completing routine inspections in some areas. They also performed routine inspections across Mn/DOT's Districts as a peer review sample so that they can provide an analysis of Mn/DOT's bridge inspection practices, policies and procedures. PB Americas will also be leading Mn/DOT personnel on a process improvement exercise.

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