



(Highland Street Bridge, City of Duluth/St. Louis County, record span of 179 ft. for prestressed concrete beams.)

State Aid Bridge News

January 2015

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Bridge Asset Management Update

Bridge Data Backlog

The Bridge Office has resolved the backlog of replaced bridges on the locally owned inventory. If you have replaced a structure and it is still in SIMS, Data Management is not aware of its removal. Please email Abigail Niemann at abigail.niemann@state.mn.us with the old bridge number, new bridge number and date opened to traffic.

Coding Guide

In 2014, MnDOT released the [Minnesota Bridge and Structure Inspection Program Manual](#) (PDF). Chapter D of this manual is the MnDOT Bridge Data Coding Guide. This new guide allows Inspectors and Program Administrators to fully understand all data items in each bridge record. This new guide will also pave the way for designers to provide data for new bridges prior to construction, which will be a massive improvement to the current process. Specifics with the new bridge inventory process will be coordinated in 2015.

Scour Code and Culvert Fill Depths

On several SAPs, the scour code has been missing in the 'Scour Confirmation Recommendation' box on the Bridge Survey Sheet. Designers do a good job of putting scour elevation in this box, however the scour code is frequently missing. Please note, the scour codes of all bridges in the state must be reported to the FHWA. If a plan does not report a scour code, it will be coded with a scour code of 'F' (no evaluation-found) which is noncompliant for a new bridge. State Aid Bridge will be looking closer to assure all new bridge plans have a score code.

Many local culvert plans have been submitted without information to correctly calculate culvert fill depths. Plans with missing fill depth information will be coded with no overburden and thus removing the culvert from 48 month inspection eligibility. Please be sure that future plans clearly report culvert fill depth.

Updating Town Bridge Improvements Costs

The improvement cost data is used to annually apportion the Town Bridge Account funds to replace, rehabilitate or remove an eligible township bridge. It is very important that each county review their township bridge improvement cost data annually. Any disagreements with the computer generated or manually supplied costs must be updated to assure a fair and proper apportionment is received. You can print out your agency Bridge Improvement Cost Worksheet on the Bridge Reports application (password=pontis123) under Miscellaneous Reports.

Cost updates need to be provided at the end of October to ensure the town bridge apportionment calculation is based on updated bridge replacement costs. This is the responsibility of

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each individual agency to complete to ensure your town bridge apportionment accurately represents your replacement costs of deficient town bridges.

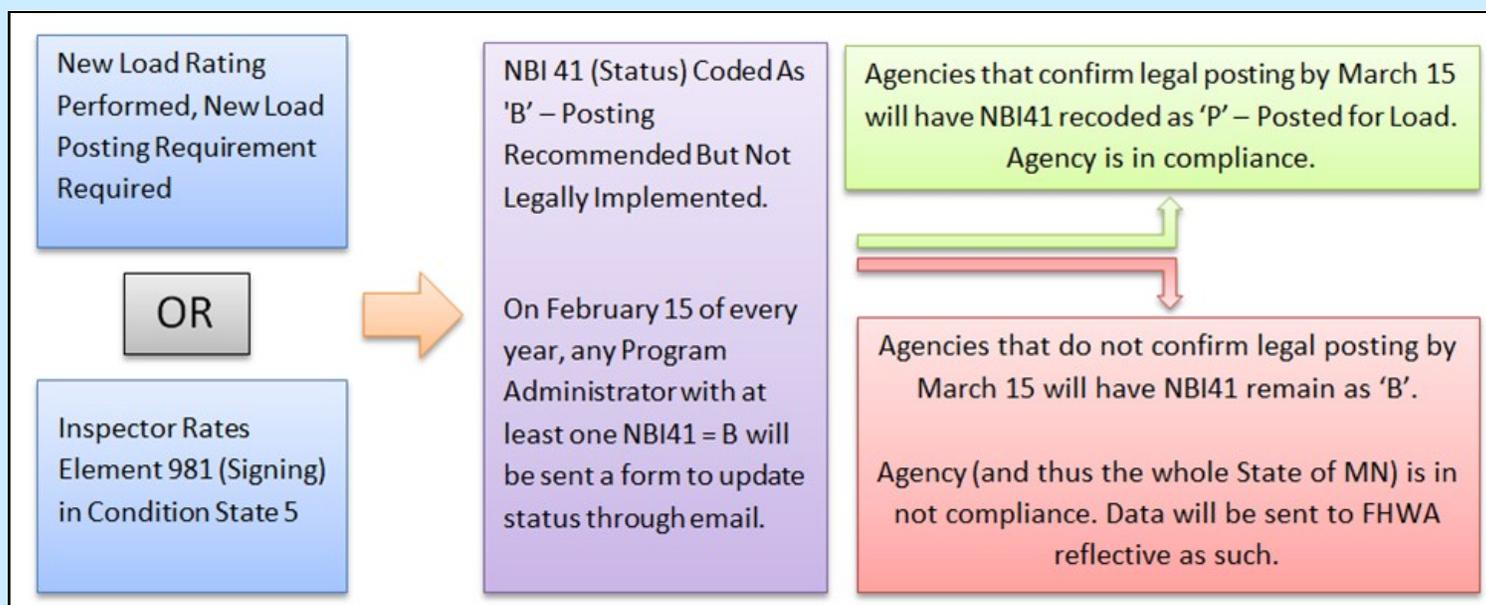
Revise and mark up a printed copy of Improvement Cost Worksheet as needed and send to Lisa Hartfiel at lisa.hartfiel@state.mn.us or Abigail Niemann at abigail.niemann@state.mn.us.

NBIS Compliance Headlines

Load Posted Bridges and NBI 41 Coding

MnDOT has been incorrectly tracking load postings in the SIMS inventory and thus made some changes. The old practice was to code National Bridge Inspection item 41 (Structure Open, Posted or Closed to Traffic) as 'P' (Posted for Load) for bridges to be posted for load restriction after a revised load rating report was submitted. The FHWA has informed us that this is the incorrect process as we are making the assumption that the structure has a correct load posting sign in the ground at the site of the bridge. Beginning April 2014, upon delivery of a load rating that requires a new or different load posting, NBI item 41 is now coded as 'B' (Open, posting recommended but not legally implemented (all signs not in place or not correctly implemented)). Also, any bridge with signing element 981 coded in Condition State 5 (Load posting sign missing or incorrect), will also have NBI 41 recoded to 'B'.

Since we need to ensure that all Minnesota bridges are properly posted, MnDOT will follow up with any bridges with NBI 41 coded as 'B' on February 15 of every year. Agencies that do not confirm posting of the required bridges by March 15 of every year will be mark noncompliant. This new process can be summarized by the flow chart below:



State policy is to post all bridges within 30 days of notification. If there are significant changes in the bridge condition or in the posted weight, temporary signs should be erected in the interim. In 2014, statutes were revised for township bridge postings. [Minnesota Statutes 165.12, Subd. 1](#) now reads, "If the town or towns fail to provide the required posting, the county is authorized to provide the required posting. Before posting a load limit on a town bridge, the county shall notify the town or towns that if the town or towns do not provide the posting within 30 days the county will provide the required posting and bill the town or towns for all related expenses."

All inspection data must be entered and approved no later than February 15, 2015

If you do not meet the February 15 deadline, your agency is noncompliant per [Minnesota Statutes 165.03, Subd. 3](#). The State of Minnesota or MnDOT is ultimately responsible to assure our local agencies are in compliance with NBIS regulations. If any one of our local agencies is found to be non-compliant with the NBIS and proactive steps are not taken to fulfill NBIS regulations, the FHWA could withhold federal aid highway funds from the state.

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Certification of Bridge Safety Inspection Form Still Required

The [Certification of Bridge Safety Inspection to the Commissioner of Transportation form](#) (PDF) must be submitted no later than the close of business on February 15, 2015. This document can be signed, scanned, and sent to Lisa Hartfiel at lisa.hartfiel@state.mn.us as an e-mail attachment.

Quality Inspections

An important aspect of a quality inspection is the documentation of deficiencies and how they have changed over time. Justification of element conditions shall be recorded in the element inspection comments for all inspection element quantities greater than Condition State One (CS1). A quantification of the deficiency shall be made along with the year of the inspection so inspectors can monitor any changes with time. Inspectors shall document that the deficiency was monitored during subsequent inspections and record any change from the initial state. A way to follow this practice is shown by the example below:

- [2012-2013] south fascia girder has 15LF of freckling rust starting at west abutment.
- [2009-2011] south fascia girder has 10LF of freckling rust starting at west abutment.

With the implementation of SIMS, inspectors now have the ability to add notes to NBI condition codes. Inspectors should use these fields to track the condition history and justifications for NBI condition codes. Inspectors should date these notes in a similar manner to that of element notes.

Bridges and Structures Training, and Bridge Inspection Webpages

Questions regarding these topics can be directed to Jennifer at Jennifer.Zink@state.mn.us or 651-366-4573.

We encourage you to visit the MnDOT Bridge Office, [Bridges and Structures Training webpage](#) for the latest training opportunities. This webpage also includes video tutorials and a link to MnDOT's YouTube channel. The training page currently shows training opportunities in bridge maintenance, and registration information for the Bridge Safety Inspection Refresher Seminars. The current video tutorials are on low slump wearing, reinforcement/concrete placement, test pile driving, and special surface finish.

Another extremely valuable webpage is the [Bridge Inspection webpage](#). This webpage includes links to manuals of bridge inspection best practices, important related tech memos, reports/forms, training/certification, SIMS access tutorials and reports, and a link to electronic bridge plans

Bridge Inspection General

Questions regarding these topics can be directed to Peter Wilson at Pete.Wilson@state.mn.us or 651-366-4574.

2015 Bridge Safety Inspection Refresher Training Seminars

- February 5- Hiway Federal Credit Union, 840 Westminster St., St. Paul
- February 12- MnDOT District 3B, Headquarters, 3725 12th St. N., St. Cloud
- February 19- Carlton County Public Works, 1630 County Road 61, Carlton
- February 26- Sanford Center, 1111 Event Center Dr. NE, Bemidji
- March 12- Courtyard Marriott, 901 Raintree Rd., Mankato
- March 19- Ramada Hotel & Conference Center, 1517 16th St. SW, Rochester
- March 26- Hennepin County Public Works, 1600 Prairie Dr., Medina

To maintain MnDOT certification as a bridge safety inspection, program administrator or team leader, attendance is required at a minimum of two bridge inspection seminars during each four year recertification period. However, those who are not required to attend are welcome and encouraged to attend.

For registration questions contact Ashley Knudson, University of Minnesota at cceconf2@umn.edu or 612-624-4754.

For curriculum questions contact Pete Wilson at pete.wilson@state.mn.us or 651-366-4574

Snooper rental policy

Snooper use is available for local agency bridge inspections. Access for inspection is a critical component to properly inspect a bridge. Bridge

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inspections are enhanced when access is achieved. A snoopers rental policy has been established by the Bridge Office to provide local agencies with this access. This policy is listed below.

County/local snoopers rental procedures through the MnDOT Bridge Office

1. Snoopers schedule must be checked first for availability through Farrell Potter or Scott Theisen. Priority for snoopers time is given to Fracture Critical and MnDOT District inspections first. Note, the sooner Farrell or Scott know the date a local agency wants to rent the better! (Please reserve the date you want, even if you don't need it until later in the year)
2. All information related to the rental must be sent to Farrell Potter or Scott Theisen for approval. Relative information includes: local agency contact information; dates and times of rental; MnDOT designated snoopers operator and driver; reason for snoopers usage. The snoopers should NOT be used for maintenance that has potential to damage the bucket or the arms.
3. ONLY MnDOT bucket operators are to operate MnDOT snoopers. The respective district in which the county or city resides (or MnDOT Bridge Office if available) will provide an operator based on availability of staff. District or Bridge Office staff will also assist the snoopers drivers with lodging, vehicle arrangements, and overnight snoopers parking as needed.
4. Traffic control must be provided by the local agency.
5. The snoopers driver and operator will charge time, expenses (which includes lodging, meals, etc.), District vehicle usage (if applicable) and snoopers equipment usage to the county/local charge ID. As of 8/18/2008, the amount/hour for snoopers rental was \$118/hour. FY 2012 rate is \$5.09/mile. The Bridge Office will still continue to bill at the \$118/hour however. The MnDOT Finance Department will ultimately make the determination what to bill based on job numbers that are flagged.
6. 30' snoopers exception - local agencies will NOT be charged a rental fee since this snoopers was paid for by State Aid. Snoopers operator and driver will still charge their time and expenses to the local agency.
7. If an agency decides to hire a consultant to perform the inspections, the consultant will need to sign a waiver.
8. For additional information please reference [MnDOT's Inspection Vehicle Policy Manual](#).

Snoopers Rental Contact Persons

Farrell Potter: 651-366-4471

Scott Theisen: 651-366-4475

Bridge Maintenance

The SIMS Maintenance Module was finalized last spring for MnDOT district users. Demonstrations of the Maintenance Module are available to local agencies by contacting Sarah Sondag at sarah.sondag@state.mn.us.

Training is also available to local agency participants through Bridge Maintenance Academy I, II and III and a Maintenance Painting Workshop. The training announcements can be found on the [SALT Trainings and Workshops webpage](#) by scrolling down to the appropriate month. If interested, please follow the registration process outlined. A brief description of each class is presented below.

Bridge Maintenance Academy I (May 4 – 8 at the MnDOT Arden Hills Training Center)

Participants will receive a classroom introduction to the fundamentals required to perform bridge maintenance effectively including bridge mechanics, bridge design concepts, plan reading, concrete, bridge safety, timber, and bridge preservation. In addition, a full day tour of bridge construction projects or manufacturing facilities will expose participants to various aspects of bridge maintenance fundamentals.

Bridge Maintenance Academy II (February 9 – 13 at the MnDOT Shakopee Truck Station)

Participants will receive an introduction to the fundamentals required to perform bridge maintenance effectively including strategies for structural steel, shotcrete, timber bridge maintenance, and formwork. Participants will also be given the opportunity to observe experts and perform hands-on bridge maintenance tasks, such as concrete formwork, rebar placement, concrete placement, finishing and curing, chain dragging, concrete removal, patching and structural steel repair.

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...continued, Bridge Maintenance

Maintenance Painting Workshop (April 14 – 15 at the MnDOT Arden Hills Training Center)

Participants will learn about changes to MnDOT's maintenance painting best practices and updates to the Bridge Maintenance Painting Manual through a one-day classroom session and a half-day workshop.

In addition, the MnDOT Bridge Maintenance Manual is currently being updated through a consultant contract. A revised manual is anticipated late August 2015.

Bridge Hydraulic News

Metric 18 audit

The FHWA recently audited us to see if we were in compliance with the NBIS. Metric 18: Inspection Procedures-Scour Critical Bridges was audited by randomly choosing 18 scour critical bridges and reviewing their Plans of Action. It was found that five of the POAs submitted were incomplete because no scour critical elevation was noted on the POA. Additional information from the bridge owners was requested and submitted to FHWA, however they felt that the POAs were incomplete at the time that the initial request was made, so the POAs were deemed non-compliant. We've noticed that some of the problems occurred on bridges with unknown foundations that were recoded to scour critical. POA templates were developed to assist in the recoding and the need for POAs to be developed for the new scour critical bridges. These were templates and information needed to be added to them to make them complete. The scour critical elevation seems to have been overlooked when the POAs were developed. If your plan has the following language:

Bridge closure plan

If riverbed in vicinity of foundation reaches critical scour elevation immediately notify the designated district contacts listed below to initiate bridge closure and detour installation.

The critical scour elevation must be noted somewhere in the POA. Guidance for dealing with bridges with unknown foundations can be found in [Appendix G](#) (PDF) of Bridge Scour Evaluation Procedure for Minnesota Bridge document.

The last time we were audited, FHWA deemed the POAs incomplete because there were no detour plans included. This was corrected and all of you made the efforts to bring the POAs into compliance by including the detours. We'd like to thank you all so much for your hard work on that effort. As construction season winds down could you please take the time to review all of your scour critical bridge's POAs to make sure that key information is included. Remember who, what, when and how. This is the contact information, the scour critical elevation, the detour information and the procedures that will be followed when the water gets high enough to trigger monitoring of the bridge.

At the end of January we will be doing an internal audit for POA compliance. We are following FHWA's example and will pull 18 bridges from all bridges rated "R". We will review them and will work with the bridge owners to make sure their POA's are acceptable.

For more information on what FHWA is looking for when they audit our program check the metrics for the [Oversight of the National Bridge Inspection Program](#) (PDF).

If you have any questions about this issue, please contact Petra DeWall at petra.dewall@state.mn.us or 651-366-4473.

Local Timber Bridge Research and LRFD Manual Chapter 8 – Wood Structures Update

Development and Integration of Advanced Timber Bridge Inspection Techniques for NBIS

This very successful research project which started back in 2012 is wrapping up with the final inspection manual for Timber Bridges to be posted on the [MnDOT Bridge Inspection webpage](#) any day now. The research team was very busy last year conducting statewide Advanced Timber Bridge Inspection Training to local agency engineers and bridge inspectors. The day long course covered the review of Timber Bridge types and materials, visual inspection techniques, advanced inspection tools (moisture meters, stress wave timers and resistance microdrills), condition assessment and ratings, integration of results into SIMS, and basic repair information. The training concluded with a hands-on inspection of a local Timber Bridge to familiarize attendees with advanced equipment. Each participant received a newly published Timber Bridge Inspection Manual, a workbook with course notes and the opportunity to operate nondestructive testing tools.

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(2014 statewide Advanced Timber Bridge Inspection Techniques Training)

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The following resources and products of this research project can be located in the bulleted list below. Eventually these items will be located at the MnDOT Bridge Inspection webpage for ongoing use.

- [\(Draft\) Inspection Manual for Timber Bridges](#) (PDF)
- [Stress wave timer demonstration](#) (YouTube)
- [Resistance microdrilling demonstration](#) (YouTube)

Specialized Timber Bridge Inspection Equipment for Local Timber Bridge Owners

The development and integration of advanced Timber Bridge inspection techniques for NBIS project has set the stage with all necessary protocols and training for improved inspections of Timber Bridges. However, full-scale implementation of this research will require that county and state inspectors have access to the specialized timber bridge inspection equipment that was identified during this project. To address this need the research team and the Minnesota County Engineering Association Bridge Committee suggested that several complete inspection equipment sets be acquired and their use coordinated and managed by the University of Minnesota Duluth, Natural Resource Research Institute for a 24 month trial period.

The research team proceeded and developed a successful proposal to the Local Road Research Board /Research Implementation Committee for funds to purchase at least three complete sets of inspection equipment. Each set would contain a stress wave timer and moisture meter and a resistance microdrill. The team also successfully captured LRRB/RIC funds for the UMD, NRRI to coordinate shipping of the equipment, additional consultation on use as necessary and to be responsible for ensuring that preventative maintenance, repair and needed supplies are managed appropriately.

A comprehensive list of inspection equipment for timber bridges was compiled and reviewed by the research team. Based on this list, a prioritized set of equipment was identified as shown in *Table 1*. This equipment will be used to generate additional feedback and recommendations on ease of use, durability and other considerations from field use by county inspectors.

Table 1 - Recommended list of inspection equipment for Minnesota’s Timber Bridges.

Technology	Manufacturer	Product Description	Pros	Est. Cost (US \$) – based on March 2014
Carrying Case	Pelican	Durable case for equipment	Very durable, can be customized for equipment	\$182 - Pelican 1600
				\$266 - Pelican 1720
Basic Inspection	Various	Inspection Hammer	Excellent tool for preliminary identification of deterioration	\$46
	Various	Miscellaneous picks and probes	Ease of use to further inspect deterioration noted through visual or hammer sounding	\$24
Moisture Meter	Delmhorst J-2000 Wood	Digital meter with hammer slide and spare pins	A valuable tool for identifying areas of high moisture content, can use 1 or 3 in. pins	\$320 - meter \$150 - slide \$250 - 1 in/ pins (100) \$230 3 in. pins (20)
Stress Wave Timers	Fakopp	Microsecond Timer	Easy to use, history of successful use, easy to read, lowest cost	\$2350/1 unit \$2220/2-5 units \$2090/6-10 units \$1960/10+
Micro Drilling	IML, Inc.	Resistograph F-Series 300 mm and 400 mm)	Dependable, long history of use in wood inspections, visual paper chart to write inspection notes on.	\$5,000-\$8500 depending on drilling length, Bluetooth options and accessories (6+ units 10% discount)
	IML	Resistograph PD Series 300 mm and 400 mm	New electronic version with Bluetooth, faster drilling, improved data processing, long battery life, reliable in testing	~\$9,500 based on drilling length, portable printer, and accessories
	RINNtech	Resistograph 440 mm	Original inventor of resistance drilling, reliable, best resolution, new unit. Excellent software for data processing.	~\$9,470 includes Bluetooth and accessories (2-5 units 10% discount, 6+ units 15% discount)

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(Reinforced Concrete Jackets to Timber Piles)

At this time advanced timber bridge inspection equipment has been purchased by MnDOT and is available for county and state use for inspecting timber bridge elements. This equipment includes: basic sounding and probing equipment, moisture meter, stress wave timer and resistance drill. Three sets of equipment are available for use. For the Timber Bridge Inspection Equipment Request Form please visit <http://z.umn.edu/timberequipmentrequest>.

Development of Cost-Effective Timber Bridge Repair Techniques for Minnesota

This research was developed to provide Minnesota local Timber Bridge owners resources of guidance for the repair of Timber Bridges. At the same time we have recognized several types of Timber Bridges that are in need of repair and maintenance. The research team is currently studying the cost-effectiveness and economics of repair strategies and extension of service life, and finalizing a timber bridge

repair manual. The research team recognizes that successful utilization of the developed manual and other materials will be heavily dependent upon getting the information into the hands of the engineers most in need.

To accomplish this, the research team has planned for five webinars, each of these webinars will provide attendees with approximately four hours of training related to the project materials. Also, the research team will host three combined short course/demonstrations at geographically diverse locations across Minnesota. These short course/demonstrations will be daylong with a portion being a classroom experience and a portion being a site visit. During the classroom experience attendees will learn the basics of Timber Bridge repair options, will receive a tutorial on the use of the manual, and several specific repair designs will be covered. Finally, a module for inclusion in annual bridge training offerings will be developed. This module will be a reduced version of the previously mentioned webinars. In all cases (webinar, short course/demonstration, module), the presentation of the materials will be recorded in a format that can be made available via the MnDOT Bridge Office website. The above outreach effort is anticipated to take place in late winter/early spring 2015.

For more information, or to become involved in the project, contact Justin Dahlberg, Iowa State University at dahlberg@iastate.edu or 515-294-9360.

Cost-competitive Timber Bridge Designs for Long Term Performance

There is a need by counties and townships to develop innovative, long-lasting and low-cost bridge options. The proposed project will provide key and valuable information on cost-competitive construction options and strategies for constructing green, sustainable timber bridges produced by Minnesota companies. Timber bridges are an important component of the U.S. highway system, especially in rural areas. The December 2012 NBI database includes 48,759 bridge structures that have timber as the primary structural member in the superstructures.

Realizing there have been significant advancements in design, preservation, maintenance and inspection of modern timber bridges, the research team with support from local bridge owners, industry, consultants, and SALT Bridge, decided to embark on another related Timber Bridge research project. The team was recently awarded funding from the LRRB to develop and a series of design, contracting and construction options and strategies for cost-competitive (initial and life cycle costs), sustainable timber bridges in Minnesota that meet AASHTO HL-93 load requirements and AASHTO LRFD bridge design specifications. The research team includes, Brian Brashaw-University of Minnesota Duluth, Natural Resources Research Institute, James Wacker- USDA Forest Service, Forest Products Laboratory, Travis Hosteng- Iowa State University, Bridge Engineering Center and National Center for Wood, and Joe Litman-LHB, Inc. The team will also be seeking input from timber suppliers and local bridge contractors. Project champions include Dave Conkel-State Aid Bridge, Matthew Hemmila-St.Louis County and Bruce Hasbargen-Beltrami County.

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The project will incorporate standard LRFD plans for timber bridge superstructures that are currently under development by the USDA Forest Service. These plans will be evaluated and modified for Minnesota and when coupled with best inspection and maintenance procedures, provide new opportunities for constructing innovative, long-lasting and “cost-competitive” Timber Bridges. Finally, several bridge construction projects would be identified with partner counties that would use the developed plans, allowing the project team to assess and validate the true initial costs of construction, predict life cycle costs and complete a life cycle assessment for these bridges. The anticipated project schedule includes a start date of July 2015 through June 2016.

Please visit [MnDOT Crossroads Minnesota Transportation Research Blog](#) to learn more about the Transportation Research Innovation Group and the Local Road Research Board FY 2016 research projects. The Cost-competitive Timber Bridge Designs for Long Term Performance project summary is located at <http://www.dot.state.mn.us/research/RFP/FY2016/Summaries/TimberBridges.pdf> (PDF).



(St. Louis County, Cherry Township, Minnesota)

Revisions for MnDOT LRFD Bridge Design Manual – Chapter 8 – Wood Structures

State Aid in cooperation with State Aid Bridge and the Bridge Office hired Ron Benson-Stantec Consulting Service Inc. to revise Chapter 8 – Wood Structures of the MnDOT LRFD Bridge Design Manual. Ron of Stantec was hired primarily based on his deep knowledge of Timber Bridge design and timber bridge load rating work, and his proven project success with timber vehicular and recreational bridges, and related load rating work. With all the Timber Bridge load rating work being performed under the SHV load rating contracts, and emphasis on cost effective timber bridge repairs and systems, it seemed timely to update the LRFD Bridge Design Manual on timber. We have seen several bridge design code changes on timber since the original development of Chapter 8- Wood Structures.

Ron’s work will include the following:

- Update the chapter to current code including wood design values and terminology.
- Include load rating guidance for timber bridges which currently is not provided in chapter 8.
- Add timber structure selection guidance for bridge replacement projects.
- Update the existing longitudinal timber deck LRFD example.
- Add a glulam beam with transverse deck LRFD example.
- Add a longitudinal spiked-laminated deck Load Resistance Factor Rating load rating example.
- Add a glulam beam with transverse glulam deck LRFR load rating example.
- Add a glulam beam with transverse spiked-laminated deck LRFR load rating example

Ron is teamed with State Aid Bridge to keep the project on schedule and to get all issues resolved and policy decisions made. Ron started this work in April of 2014, and we anticipate the project will be completed by April of 2015.

Local Historical Bridge Preservation Update

Local Historic Bridge Study Phase II

We are very happy to say that this intensive statewide study (* 126 extant (surviving) local bridges were studied by LHB, Mead & Hunt and the 106 Group) project to inform local historic bridge owners on the existing physical condition, historic significance and recommendations for preservation of their bridge is nearly complete. This study began in the spring of 2013 and it included multiple work tasks as listed below. The consultant
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team of LHB, Mead & Hunt and the 106 Group, MnDOT's Cultural Resources Unit, SALT, State Aid Bridge, USACE, SHPO, FHWA and local historic bridge owners did a great job collaborating, meeting, and assuring the products of this study are of high quality in accuracy, and will meet the needs of the various local historic bridge owners and stakeholders for many years to come.

- Field survey, including both historic and engineering analysis for select bridges in the study pool
- Preparation of bridge reports, which include both historic and engineering information (engineering information included maintenance, **stabilization and ***preservation recommendations, and associated cost estimates. It also included preliminary design, final design and construction administration cost estimate). These costs were tabulated into a large master planning spreadsheet for future planning and special state funding program considerations. Very preliminary estimates would suggest a total cost of \$100 million to maintain, stabilize and preserve our current inventory of local historic bridges.
- Development of a database and website to collect and share information. Please see the great addition to the MnDOT Historic Bridge website where you can now [search for a Minnesota historic bridge](#) by region and discover the history and significance about the bridge. Note, eventually the final bridge reports from the Phase II Study will be added to the Historic Bridge webpage under the "Additional Information" section.
- Provided a summary of best practices in funding and programmatic agreements from other states
- Conducted local historic bridge owner outreach meetings

*FYI: In total, Minnesota is home to 227 known, extant (surviving), historic bridges. These include 58 MnDOT owned bridges and 169 owned by others. Within the population of bridges owned by others, 126 were studied in the Mead & Hunt and LHB project and 27 under contract with Hennepin County Regional Rail Authority (completion estimated in 2015). The remaining 16 historic bridges were not included in either study for one of the following reasons: previous rehabilitation, being in storage, plans for replacement or being identified late in the study process. These bridges are recommended for further review and management plan preparation as part of a future Local Historic Bridge Study project.

Definitions

*****Preservation** – Historic preservation that is consistent with the Secretary of the Interior's Standards for the Treatment of Historic Properties. Historic preservation means saving from destruction or deterioration old and historic buildings, sites, structures, and objects, and providing for their continued use by means of restoration, rehabilitation, or adaptive reuse. It is the act or process of applying measures to sustain the existing form, integrity, and material of a historic building or structure, and its site and setting.



(City of Bloomington, Old Cedar Avenue Bridge over Long Meadow Lake)

****Stabilization** – The act or process of stopping or slowing further deterioration of a bridge by means of making minor repairs until a more permanent repair or rehabilitation can be completed.

Notable 2014-2016 Local Historic Bridge Projects

- Hennepin County, Franklin Avenue Bridge 2441. Rehabilitation of Concrete Arch, let December 2014, cost \$43 million, 2015-2016 construction.
- City of Minneapolis, North Town Bridge 27B97 (formerly St Anthony Parkway Bridge). Replacement of 5-span Warren Truss Bridge, letting January 2015, estimated cost \$20 million, 2015-2017 construction.
- City of Minneapolis- 10th Avenue Bridge 2796, Rehabilitation of Concrete Arch, Approximate Cost \$40M, 2016-2017 Construction
- City of Bloomington, Old Cedar Avenue Pedestrian Bridge 3145. Rehabilitation of 5-span Camelback through Truss Spans, estimated cost \$15 million, 2015-2016 construction.
- Blue Earth County, Amboy's, Dodd Ford Bridge 1461. Rehabilitation and Retrofit of Through Truss, let December 2014, cost \$1.5 million, 2015 construction.

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- City of Minneapolis, Pedestrian Bridge #9. Rehabilitation of railroad through Truss Bridge, let August 2014, cost \$1 million, 2014-2015 construction.
- City of St. Paul, Como Pedestrian Bridge L5853. Rehabilitation of Concrete Arch, let July 2014, cost \$1 million, 2014-2015 construction.
- City of Granite Falls, Granite Falls Pedestrian Bridge R0657. Rehabilitation of Suspension Bridge, let June 2014, cost \$2 million, 2014-2015 construction.
- Olmsted County, Mayowood Dam Bridge. Rehabilitation of Steel Stringer Bridge, let December 2012, \$1.5 million, opened November 2014.
[Read more about Mayowood Bridge opening.](#)

2014 MnDOT/AGC Local Bridge Construction Awards

The winners for the 2014 MnDOT/AGC Bridge Construction Awards have been selected. We would like to congratulate Hubbard County and District 2 for being selected as a winner for bridges in the cost category below \$1.5 million. The winning bridge number is 29532 and carries CSAH 18 traffic over Shallow River. The bridge was designed by WSN and constructed by Redstone Construction Inc. We would also like to congratulate the City of Thief River Falls and District 2 for being selected as the winner for bridges in the cost category between \$1.5 – \$5 million. The winning bridge number is 57525 and carries Canadian Pacific Railway over Greenwood Street in Thief River Falls. The bridge was also designed by WSN and constructed by Edward Kraemer & Sons, Inc.

Award winners will be honored at the 2015 MnDOT/AGC spring meeting typically held in early May at the AGC office. A brief presentation of the projects will be made by the State Bridge Engineer and award winners will be recognized. Plaques and project photos will be presented to each member of the winning teams and group photographs will be taken.

The rating panel found numerous examples of high quality workmanship on the reviewed bridges, and we encourage local bridge owners to continue to strive for excellence in bridge construction on all of your projects. We look forward to seeing bridges from your local agency in future submittals.



(The Greenwood Street Underpass and Canadian Pacific Railroad Bridge (The railroad bridge and underpass were the final pieces of the corridor project that was envisioned by city leaders nearly 60 years ago.)

MnDOT Bridge Standards Unit Update

Precast Concrete Box Culvert

In September 2014 the culvert standards were updated to reference the correct 2014 construction specification numbers, and to improve the embankment protection sheet by removing the class II riprap in gabions option, and adding a riprap class table with a riprap class type III or IV option to be selected by the designer. A note was also added to the culvert design sheet with more information on culvert ties. If "U Bolt Ties" (refer to Roadway Standard Plate 3145) are used to secure culvert sections you need approximately 18" of room between adjacent lines of box culverts to allow for installation. However this distance can be reduced to as little as 6" by using a "Double Connection Tie" (refer to Roadway Standard Plate 3145) and placing the tie on the interior side of the second (and third) culvert line.

For those local agencies interested in the culvert standard plans in AutoCAD version 2004 format, please [contact the State Aid Bridge Unit](#). We would like to thank WSN Consulting Engineers for converting these drawings from MicroStation to AutoCAD format. The 2004 format should be

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...continued, MnDOT Bridge Standards Unit Update

able to be used by any agency running AutoCAD 2004 or later. Please download the [Bridge Standard Plans Manual](#) which includes all of the revision log history, and the PDFs of the standard figures to assist you in checking for any possible conversion errors.

Implementation of the new 2014 AASHTO LRFD Bridge Design Specifications

The new 2014 AASHTO LRFD Bridge Design Specifications should be used on all local bridge projects. Please modify the first line of the "DESIGN DATA" block on the front page of bridge plans to read, "2014 AND CURRENT INTERIM AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS." The Bridge Standards Unit will review the existing concrete box culvert and cast-in-place retaining wall standards to determine if the new code will require changes to the sheets.

Standardization of Bearing Pads for Prestressed Beams

The time it takes to deliver bearings has become an issue on bridge projects. Standard pads would allow stockpiling, which would greatly improve the delivery time. As proposed, the Bridge Office has approved standardization of expansion bearing pads for Prestressed Beams into groupings to allow fabricators to stockpile pads to reduce delivery time. The groupings will include two standard bearing sizes for expansion bearings (12" x 24" pad); a 2 1/2" thick pad with three laminates, and a 4 3/8" thick pad with six laminates. The use of these two pad sizes should cover about 90 percent of typical Prestressed Beam bridges. At this time, there are no proposed changes to fixed Bearing Pads. Designers are encouraged to begin using the new standard sizes immediately, and later this spring Dave Dahlberg, MnDOT Bridge Design Manual and Policy Engineer, will add this guidance to the LRFD Bridge Design Manual and a letter will be sent to fabricators and consultant designers to inform them of this change.

Elastomeric Pads "walking" out from under beams

A Bridge Office subcommittee has met several times to review photos submitted by several districts showing Bearing Pads walking out from under beams & bearing plates, even those that have "keeper" studs mounted to the underside of the Bearing plate. A review of designs from the affected bridges indicates that the design met the appropriate design code requirements. Several of the bridges that have exhibited substantial pad movement are Prestressed Girder bridges with flat grades and no skew, which would not seem to be likely candidates for excessive pad movement. The subcommittee has begun development of standard details for a restraint system to hold pads in place and will be reviewing recent research articles on this topic. The Metro District is also monitoring several bridges to see if they can determine what is causing the movement.

Modifying Plan Standards and Revised Sheets

New guidance has been established for what to do if revisions to standard sheets are needed. Three categories of revisions have been established, standard is unmodified (standard details, notes and dimension are used with no changes), standard is modified (standard details, notes and dimensions are specifically changed) or standard is substantially modified (standard details, notes and dimensions are changed with extensive modifications). If the standard is unmodified, simply cross out those details that do not apply. If the standard is modified, place the word "MODIFIED" under the standard B Detail or Figure number. Also add a box containing a note stating what was modified. If the standard is substantially modified, remove the State Bridge Engineer approval block and figure number; the engineer is taking full liability for the details shown. A similar write up will be added to the MnDOT LRFD Bridge Design Manual in Section 2, "inclusion of standard bridge details in plan sets" shortly.

Pile Corrosion Update

We met with other north central states on integral abutments to see how they guard against pile corrosion. Like Minnesota, Nebraska also has seen deterioration of H-piles and was considering alternate protection courses including painting to 3' below ground (currently paint exposed), encasement, or concrete piles. Illinois piles are typically far enough below ground that they do not get enough air to corrode except at integral abutments where they currently use sacrificial steel for corrosion protection. With additional information provided by Iowa and Wisconsin, Minnesota has now adopted specification language to require either painting or galvanizing H-piles and CIP steel pile shells from the cut-off elevation to an elevation extending a minimum of 10 feet below the defined ground surface or bottom of water channel.

Inverted Tee Bridges Update

Approximately 15 inverted tee bridges have been built in Minnesota, but most have exhibited more deck cracking than similar bridges built with a conventional cast-in-place slab span superstructure. However the last Inverted Tee Bridge was constructed on trunk highway 36 over Keller Lake in Maplewood and was built in two stages. The first stage used conventional concrete in the deck. In the second stage, deck placement with polypropylene fibers were used, which exhibited significantly less cracking than the first stage. Based on these findings the Bridge Pre-Design Unit has

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...continued, MnDOT Bridge Standards Unit Update

been asked to help identify two potential sites for Inverted Tee Bridges for construction in the next year or two. The Bridge Construction Unit is also looking to identify a few multi-girder beam bridges for inclusion of fibers in the deck. The Standards Unit will continue to work with the State Aid Bridge Unit to encourage construction of several more Inverted Tee bridges with synthetic fibers in the deck concrete. Development of design tables and a standard plan sheet will start later this winter.

High Performance Concrete on Local Bridges

We wanted to bring to your attention changes that are being made to concrete deck and slab mixes. You have probably heard that MnDOT is moving to High Performance Concrete deck and slab mixes to lower concrete costs with less cement and to provide more durable concrete deck and slabs with less cracking. The MnDOT Bridge and Concrete Offices have been working for some time with HPC mix designs. In August 2014 we encouraged our local bridge consultants and owners to start specifying HPC. Since this time, we have seen local bridge consultants/owners showing interest in using HPC and the new HPC spec and the Concrete Office has been working with them. The online special provision for HPC is near completion and will be posted shortly. If you need a special provision in the interim you can contact either Ron Mulvaney of the Concrete Office at ronald.mulvaney@state.mn.us or Ed Lutgen of the Bridge Office at edward.lutgen@state.mn.us for a HPC special provision. Local bridge consultants/owners are encouraged to work with the Concrete Office to determine the availability of HPC on their specific projects. We appreciate your attention to this new change, and hopefully we will start seeing less deck cracking and fewer calls from our local bridge owners. Please note, MnDOT's policy regarding the use of concrete wearing courses has not changed, and will remain in place until they have more data regarding performance of the new HPC mixes, however, the local bridge consultant/owner should still use engineering judgment in determining if a full depth deck makes more sense than a structural slab plus wearing course for a particular local bridge.

Use of Lightweight Aggregate to Reduce Unit Weight

The MnDOT Concrete Office is currently working with a concrete producer and American Engineering Testing to conduct testing of several lightweight concrete mixes. Some mixes will be designed to minimize the unit weight. It's still too early in the testing to draw any conclusions. Lightweight concrete will be used on the rehabilitated Cedar Avenue Pedestrian Bridge.

Bridge Costs Update

Calendar year 2014 saw a small unit cost increase for Prestressed Concrete Beams and a moderate unit cost increase for the C-SLAB type structures. These two structure types account for the majority of local bridges. As is usually the case, the C-SLAB structure type is the lowest unit cost structure on the local system.

We also let a single C-ARCH (three sided concrete arch structure, supplied by CONSPAN) in CY 2014, which came in at about \$449/sf. We let seven steel pedestrian TRUSS structures in CY 2014 and their unit cost was down significantly from last year. Steel truss bridge prices fluctuate greatly from year to year and likely reasons are the size/length/location of these bridges which can vary widely and these factors can affect the unit cost.

There was a pronounced decrease in the number of C-SLAB bridges compared to CY 2013 (11 let in CY 2014 vs. 39 let in CY 2013). There was a small decrease in the number of PCB bridges compared to CY 2013 (23 let in CY 2014 vs. 28 let in CY 2013). The unit cost percentage increases/decreases are shown below.

- PCB structure costs were up 4 percent (\$130.44/sf. in CY 2013 vs. \$136.58/sf. in CY 2014)
- C-SLAB structure costs were up 10 percent (\$110.91/sf. in CY 2013 vs. \$123.08/sf. in CY 2014)
- TRUSS pedestrian structure costs were down 25 percent (\$322.73/sf. in CY 2013 vs. \$243.64/sf. in CY 2014)

We replaced approximately 50 timber bridges and one fracture critical bridges in CY 2014. Timber bridges are considered to be of full timber construction or timber pile/abutment construction. The fracture critical bridges were low truss or high truss steel bridges.

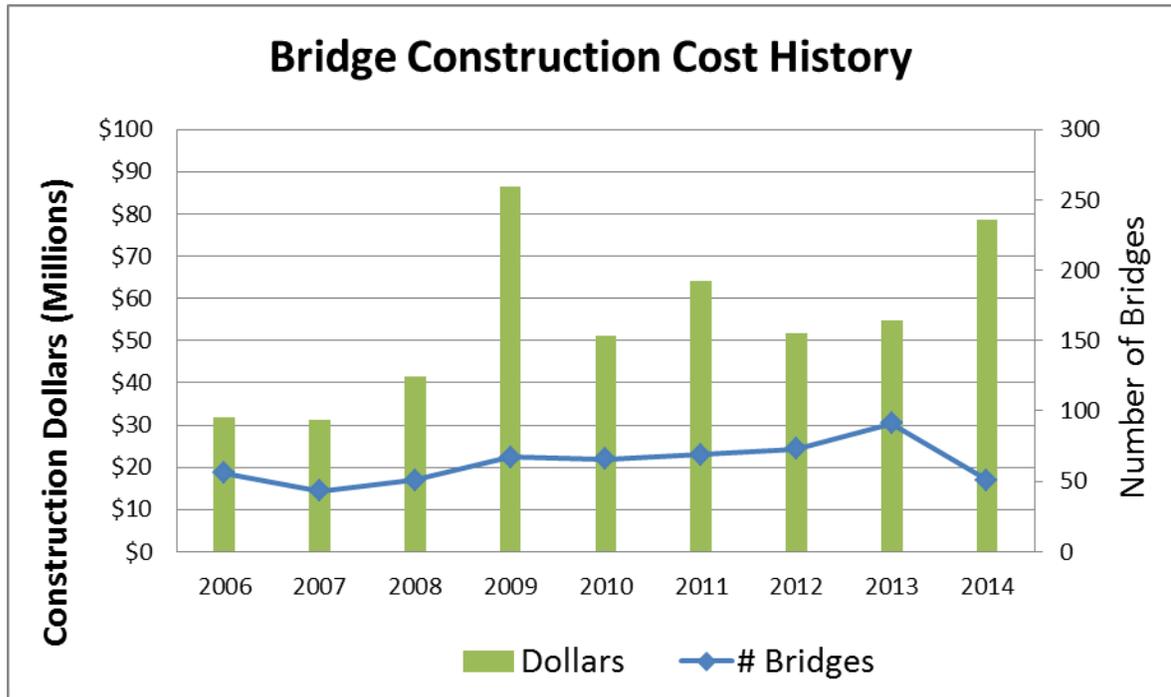
Of the 50 timber bridges replaced in CY 2014, 31 of them were replaced with concrete box culverts, seven were replaced with C-SLAB bridges and 12 were replaced with PCB bridges.

The single fracture critical bridge replaced in CY 2014 was replaced with a PCB bridge.

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...continued, Bridge Costs Update

Please visit our Bridge State Aid Information and Resources webpage. You can locate our Annual Bridge Cost Reports on this webpage. The Annual Bridge Cost Report shows cost reports per local bridge structure type, a summary table of local bridge structure type cost history, a cost report for local bridge structure lengths less than 150 feet, cost report for local bridge structure lengths greater than 150 feet, and a cost summary table for all local bridges.



Local Bridge Replacement Program Update

State Bond Funds

The 2014 legislature appropriated \$33 million for the Local Bridge Replacement Program in two separate bills; one is commonly referred to as the “cash bill” and the other is called the “bonding bill.” House file 1068 appropriated \$20.7 million from the state’s general fund and HF 2490 appropriated \$12.3 million from in bond proceeds from the state transportation fund.

Hennepin County was identified in the bonding bill (HF 2490) to receive an earmark for the Franklin Avenue Bridge, which was awarded \$12.3 million of LRIP funds. Total project cost was \$43 million and the project was funded with a combination of federal, state bonds, state aid and local funds. The [Franklin Avenue Bridge](#) (bridge 2441) is a significant historic statewide resource and everyone benefits from the county and state’s investment to rehabilitate this important bridge. To find out more about the Franklin Avenue Bridge and Minnesota’s other historic bridges at the [Historic Bridge website](#).

The remaining \$20.7 million of local replacement bridge funds in the cash bill (HF 1068) were distributed to 53 bridge projects statewide. The [2014 bridge project list](#) (PDF) can be found on the [LRIP webpage](#). Blue Earth County was selected to rehabilitate another significant historic bridge, bridge 1461 over the Blue Earth River. You may also view historic information on [bridge 1461](#) on the Historic Bridge website.

At this time, all the bond funds are accounted for and all newly approved bridge projects will be put on the bridge funding waiting list. If you decide to move forward with local or state aid funds, please inform the State Aid Program Manager and your District State Aid Engineer. There may be an opportunity to fund a few additional bridges with state transportation funds this spring or summer if the selected 2014 bridges have bids close to their estimates. The waiting list has approximately 40 bridge projects that are either approved or in progress requesting \$6.7 million in bond funds with a total replacement cost of \$13.7 million.

Summary of Bond Funds

In 2014, 142 local bridges were replaced, rehabilitated or removed at a total cost of \$116.5 million. This included \$23.1 million in federal funds,

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...continued, Local Bridge Replacement Program Update

\$41.7 million in state aid funds, \$13.6 million in town bridge funds, \$35.1 million in bond funds and \$5 million in local funds. Township bridges accounted for 70 of the 142

Agencies should update their bridge priority list annually by submitting a county board or city council resolution following the guidance and resolution format on the LRIP webpage. This information helps demonstrate the need and justification for funding the local bridge replacement program in the upcoming legislative session.

Engineering Services Standard Checklist

At the request of the County Engineer's Bridge Committee, an Engineering Services Standard Checklist was developed to assist local bridge owners with developing consultant contracts. The checklist resides on the [State Aid Bridge website](#) under the Guidance header on the homepage.

The development of the checklist included input from local bridge consultants, County Engineers and other local bridge owners. The list includes the important bridge work items that are consistent with our State Aid Plan with Bridges Review Checklist located in the [State Aid Manual](#) in Chapter 5.4, V. Plan Approval, B. Plan Approval Procedure, Plan and Proposal Approval Procedures table.

Local Bridge Rating and Permitting Update

Special Hauling Vehicles

Minnesota has been engaged in Special Hauling Vehicle evaluations for seven years now. The first set of consultant contracts consisted of the top 1,000 local bridges with highest priority and most susceptible to SHV's. To date, under the SHV load rating contracts 1, 2 and 3, we have completed the load rating analysis of approximately 2,077 local bridges of which 1,863 are now in Virtis. The fourth SHV load rating contract is currently underway with approximately 860 bridges that are in need of a SHV load rating evaluation.

Once again, due to the high number of bridges, we divided the contract into five separate local bridge consultant contracts. The team of consultants includes Erickson Engineering, LHB, SRF, Stantec and WSN. The bridges were selected and prioritized using a bridge selection process. This method of prioritizing included structure types, operating rating values, load rating dates, superstructure and substructure NBI conditions and replacement needs (i.e, bridges scheduled for replacement within the next two years).

To date, 452 (52 percent) of the 860 bridges have been evaluated and 180 bridges (40 percent) required load posting. So far the contract looked at approximately 156 timber slab bridges and 91 steel beam bridges. Sixty percent of the timber bridges and 59 percent of the steel beam bridges required load posting. Once more, the short span timber and steel beam bridges were most affected by the SHV trucks.

To continue our efforts to get all of the load ratings of our local bridge inventory into Virtis, and to fulfill the recent FHWA directive on load rating and load posting bridges for SHVs, the statewide SHV load rating consultant contract proposal #5 is now being prepared to be advertised. State Aid Bridge sent out an email to the affected local bridge owners on December 30, 2014 along with a preliminary bridge list that is being considered for SHV load rating analysis. The purpose of the email was to seek help to further refine and prioritize the list. We are encouraging everyone that received the email to review the spreadsheet and identify bridges within their jurisdiction that are proposed to be closed/replaced within the next two years. Please send your response to Moises Dimaculangan by February 2, 2015.

New Bridge Posting Requirements for Specialized Hauling Vehicles

Studies have shown that SHV trucks force effects in bridges exceeds the stresses induced by the Type 3, Type 3S2, or Type 3-3 legal vehicles by over 50 percent in certain cases. As a result, new legal models for SHVs were developed and adopted by AASHTO, and are now required to be included in bridge load rating analysis.

As a result, on November 15, 2013, the FHWA sent a memo to all states on requiring every state to post bridges for SHVs that do not pass a load rating analysis for these legal vehicles. The FHWA has established the following timelines for rating bridges for SHVs. For bridges



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...continued, Local Bridge Rating and Permitting Update

with the shortest span length less than or equal to 200 feet should be re-rated after their next NBIS inspection, but no later than December 31, 2017. For bridges that have the shortest span greater than 200 feet should be re-rated no later than December 31, 2022. The FHWA recognizes that Minnesota has been engaged in SHV evaluations and is well ahead of other states in meeting this aggressive timeline. State Aid Bridge and the Bridge Office will continue to work with the FHWA and local bridge owners to complete the SHV evaluations for our entire local bridge inventory as soon as reasonably possible.

Special Hauling Vehicles Contracts Load Posting Survey

On August 26, 2014, Minnesota was notified to be in Federal Non-Compliance with Metric 14 Inspection Procedures - Post or Restrict. On behalf of the FHWA, State Aid Bridge issued a posting survey in July of 2014 regarding signing local bridges for SHV load posting. The survey was to determine how local agencies are doing on load posting signs as required under the statewide SHV load rating contracts 1, 2 and 3. There were 922 out of 2,080 local bridges that required load posting signs.

Email invitations were sent to 81 subject counties, requesting them to take this important survey. Under this survey we requested that load posting signs be installed by November 17, 2014. Participants had 10 weeks to complete the survey; and we're happy to say that approximately 97 percent of the 81 participants completed the survey. The remaining 3 percent are still in need to load post their bridges as soon as possible, and to inform Moises Dimaculangan (State Aid Bridge Load Rating Engineer).

Note, when a load rating is completed and it shows that the bridge is to be load posted, it is mandatory that the posting signs be erected within 30 days, otherwise temporary signs should be erected in the interim. Load posting signs are a federal mandate. Please notify the Bridge Data Management Unit when you have confirmed that the posting signs are in the ground. Also, in order to document that your bridge has been properly signed for the load posting, dated photos of the installed posting signs should be taken at each end of the bridge, and entered into SIMS.

Authority of Counties to Post/Close Township Bridges – 2014 Minnesota Law

Last year, the Minnesota state legislature passed a bill regarding authority of counties to post/close a township bridge when the township fails to do so. The bill was a partnership effort between the Minnesota Township Association, State Aid Bridge and MCEA Bridge Committee. Language in [section 9, subdivision 1](#) of the bill was revised to clarify counties authority to act. Though, the county will not be held liable for posting a township bridge if the township fails to do so, the state is relying heavily on the county to make sure township bridges get posted according to federal law.

Local Permit Coordination Project

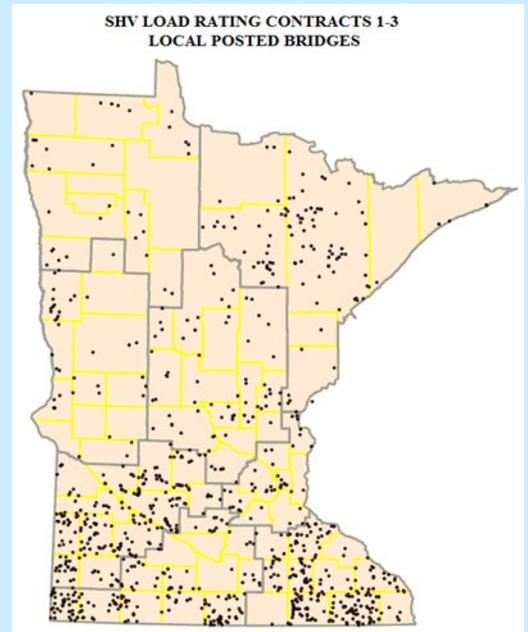
The Office of Freight and Commercial Vehicle Operations engaged the consulting services of Cambridge Systematics to help it determine the practicality of a Statewide Coordinated Permitting Process, and what that may look like. The main themes to explore were: ease and efficiency for carriers to purchase over-dimensional load permits; collaboration and coordination between agencies (MnDOT, county, municipality); consistency in process and mitigate expectations.

Cambridge held interviews during October and November 2014 with 25 local agencies, six motor carriers in a mix of one-on-one and group sessions. Additionally, a dozen other states were interviewed by phone/email.

So far, initial findings show a divergent philosophy between agencies: local agencies either show a reluctance or relative disinterest to permitting, or a proactive and engaged interest in permitting. There is generally limited interaction between MnDOT and local permit agencies.

Local overweight permit volumes are 1-3 percent of MnDOT permit volumes. Up to six permits per day is a busy day for most local agencies. In contrast, MnDOT issues approximately 200 permits per day during its "slow" season, and about 400 permits per day during "busy" season (summer). Most local agencies have an annual permit, with a 'check with me first' request before each move. Carriers operate mostly on the honor system; many times, agency response time inhibits compliance and a carrier doesn't wait for approval before making its move.

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...continued, Local Bridge Rating and Permitting Update

Several local agencies say: "Not enough of our bridges have had a load rating analysis". Several interviewees requested more assistance from MnDOT to facilitate load ratings (Note, MnDOT has been engaged in load rating local bridges under the SHV load rating contracts). Most local governments do not have the level of data detail to fit within MnDOT's business system requirements. For example, they do not ask for axle weight or axle spacing information for overweight loads. They may ask whether a vehicle meets a 9 or 10-ton axle weight; but no information that indicates specific ESAL. Some counties will even not issue permits for over 80,000 lbs. GVW.

The final report should be available by early February 2015.

Study of the Impacts of Implements of Husbandry on Bridges Update

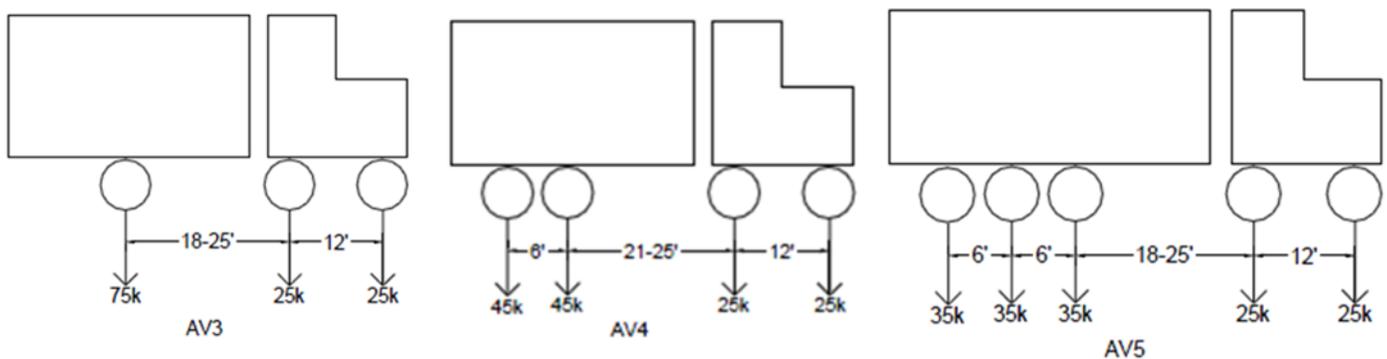
Currently, there are no known national specifications or guidelines regarding how to load rate and post our bridges for these non-traditional vehicles. A lot has been done on this pooled fund study since the last 2013 State Aid Bridge Newsletter update.



(Load Test Vehicles)

Through internet searches and manufacturer inquiries, information regarding axle weights and configuration was gathered. Researchers found 121 different possible combinations of husbandry vehicles ranging from two to six axle vehicles. The formation of these combinations aimed to encompass most combinations seen on today's U.S. secondary roadway bridges.

Based on the information gathered from physical testing and analytical modeling, researchers found the controlling vehicles to be the 3, 4 and 5 axles farm vehicles. They then took the characteristics of the controlling vehicles and used them to create test vehicles that would represent the 121 husbandry vehicles. These test vehicles were then slightly modified to create the generic agricultural rating vehicles that could be used in load rating analysis. Below are the possible generic agricultural vehicles that are being proposed.



The proposed generic vehicles are well above the legal weight limit on bridges in Minnesota. There are concerns that based on the weight alone of the proposed generic agricultural vehicles when performing a bridge load rating, a lot more local bridges would need to be load posted. Thus, there is more research to be done at this point that could possibly help reduce the load effects of these vehicles such as, reducing live load impacts by way of reducing speed when crossing over the bridge, single lane loaded analysis versus multiple lane loaded, etc.

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...continued, Study of the Impacts of Implements of Husbandry on Bridges Update

It is well worth noting that statutorily, a person operating or towing an implement of husbandry on a bridge in Minnesota must comply with the state gross weight limitations provided in Minnesota Statute 169.824. The operator must also comply with the posting sign that limits the maximum weight allowed on a bridge. At this point, it comes down to educating farmers on what the laws say about weight limitation of farm equipment on a bridge.

A brief definition and interpretation regarding bridge weight limit on farm equipment for all six states participating in this study are summarized and listed below.

Minnesota Law

Definition of Implements of Husbandry

- Any vehicle designed or adapted exclusively for agricultural, horticultural or livestock operations, or for lifting and carrying an implement of husbandry. Any towed vehicle, which meets this definition, is also an implement of husbandry. This includes wagon trailers and implement trailers used in a farm operation.

Interpretation of Bridge Weight Limits

- Every driven and towed implement of husbandry must comply with posted bridge weight limits.
- For unposted bridges, a person operating or towing an implement of husbandry on a bridge must comply with the gross weight limitations provided in the Minnesota Statute section 169.824, the maximum gross weight in pounds on a group

Distance in feet between centers of foremost and rearmost axles of a group	Consecutive axles of a 3-axle vehicle having a total of 3 or more axles	Consecutive axles of a 4-axle vehicle having a total of 4 or more axles	Consecutive axles of a 5-axle vehicle having a total of 5 or more axles
30	58,500	62,000	67,000
50	60,000	75,500	79,500
60	60,000	80,000	85,500

Iowa Law

Definition of Implements of Husbandry

- Vehicle or special mobile equipment designed for agricultural purposes and used exclusively in an agricultural operation. Implements of husbandry include: Combines, farm tractors (wheeled or tracked), fertilizer and chemical applicator, fence-line feeders, grain carts, gravity-flow grain wagons, tank wagons

Interpretation of Bridge Weight Limits

- Every driven and towed implement of husbandry must comply with posted bridge weight limits.
- If the bridge is not posted, then all implements of husbandry are exempt from weight limit except the following:

Wheeled grain carts, tank wagons, and fence-line feeders	20,000 pounds per axle 80,000 pounds maximum gross vehicle weight
Tracked grain carts, tank wagons, and fence-line feeders	Comply with weight in track length chart (in Iowa truck guide)
Nonpermitted, self-propelled flotation applicators	20,000 pound maximum per axle
Permitted, self-propelled flotation applicators	25,000 pound maximum per axle

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...continued, Study of the Impacts of Implements of Husbandry on Bridges Update

Nebraska Law

Definition of Implements of Husbandry

- Every vehicle or implement designed and adapted exclusively for agricultural, horticultural, or livestock-raising operations or for lifting or carrying an implement of husbandry and used primarily off any highway.

Interpretation of Bridge Weight Limits

- Every driven and towed implement of husbandry must comply with posted bridge weight limits.
- If the bridge is not posted, the maximum gross weight in pounds on a group

Distance in feet between centers of foremost and rear-most axles of a	Consecutive axles of a 3-axle vehicle having a total of 3 or more axles	Consecutive axles of a 4-axle vehicle having a total of 4 or more axles	Consecutive axles of a 5-axle vehicle having a total of 5 or more axles
30	58,500	62,000	66,500
50	60,000	75,500	79,000
60	60,000	80,000	85,500

South Dakota Law

Definition of Implements of Husbandry

- Every vehicle designed or adapted and used exclusively for agricultural operations and is only incidentally moved or operated upon a highway.

Interpretation of Bridge Weight Limits

- Every driven and towed implement of husbandry must comply with posted bridge weight limits.
- If the bridge is not posted, the maximum gross weight in pounds on a group

Distance in feet between centers of foremost and rear-most axles of a	Consecutive axles of a 3-axle vehicle having a total of 3 or more axles	Consecutive axles of a 4-axle vehicle having a total of 4 or more axles	Consecutive axles of a 5-axle vehicle having a total of 5 or more axles gross
30	58,500	62,000	67,000
50	60,000	75,500	79,500
60	60,000	80,000	85,500

(continue on page 19)

...continued, Study of the Impacts of Implements of Husbandry on Bridges Update

Illinois Law

Definition of Implements of Husbandry

- Every vehicle designed and adapted exclusively for agricultural, horticultural, or livestock raising operations, including farm wagons, wagon trailers, or like vehicles used in connection therewith, or for lifting or carrying an implement of husbandry.

Interpretation of Bridge Weight Limits

- Every driven and towed implement of husbandry must comply with posted bridge weight limits.
- If the bridge is not posted, then all implements of husbandry are exempt from weight limits except

Farm wagon, fertilizer buggies, sprayers, auger wagons, liquid manure wagons, liquid fertilizer carts, and virtually any other car-type farm implement (weight excludes towing equipment, i.e. tractor)	36,000 pound gross vehicle weight
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Wisconsin Law

Definition of Implements of Husbandry

- A self-propelled or towed vehicle that is manufactured, designed, or reconstructed to be exclusively used in the conduct of agricultural operations. Implements of Husbandry may include:

Category A:

- Farm tractors
- (a farm tractor towing tillage, planting, and cultivation equipment meets the Category B definition)

Category B:

- Self-propelled combine
- Self-propelled forage harvester
- Self-propelled fertilizer or pesticide applicator
- Towed tillage
- Planting and cultivation equipment and its towing power unit

Category C:

- Farm wagon
- Farm trailer
- Manure trailer

Interpretation of Bridge Weight Limits

- Every driven and towed implement of husbandry must comply with posted bridge weight limits.
- If the bridge is not posted, the maximum gross weight in pounds on a group

Distance in feet between centers of foremost and rearmost ax-	Consecutive axles of a 3-axle vehicle having a total of 3 or more axles	Consecutive axles of a 4-axle vehicle having a total of 4 or more axles	Consecutive axles of a 5-axle vehicle having a total of 5 or more axles
30	67,275	71,500	77,000
50	69,000	87,000	91,500
57	69,000	92,000	92,000

Survey of Concrete Hammerhead/T-Pier Designs Prior to 1984

As you may know SALT Bridge and the MnDOT Bridge Office were engaged in assisting the City of St. Paul with load rating the Kellogg Blvd Bridge. This bridge was one of the bridges listed in the statewide Special Hauling Vehicles Contract 4. Unfortunately the original SHV load rating effort led to additional detailed load rating analysis of the T-Pier cantilevers, which had been showing signs of distress and evidence of structural shear cracking. After the T-Pier cantilevers load rating analysis was completed, it revealed that the shear design of the cantilevers were substantially insufficient according to current AASHTO bridge design specifications. However, it was confirmed that the original shear design of the cantilevers was properly designed according to the 1977 AASHTO bridge design specifications for this period.



(Bridge 62080, Br. 62080A, Kellogg Blvd.)

It appears that around 1983, AASHTO revised the code on shear design, perhaps partly based on further research/studies, and inspection findings of shear cracking in bridges across the country. In an effort to understand if we have other bridges supported on hammerhead or T-Piers with similar shear concerns, SALT Bridge sent an email in October 2014 asking for local bridge owners assistance to identify any pre 1984 designed hammerhead or T-Pier bridges that show or have inspection records of shear cracks in the cantilevers. Hopefully the Kellogg Bridge is just an anomaly and not a state wide issue for this era of bridge design. Depending on your findings, we'll work with the Bridge Office and the FHWA to assist you with some sort of direction or guidance to address any structural concerns. If shear cracks are observed in the pier caps or pier cap cantilevers, it's likely we will request that the bridge be reload rated to evaluate the load carrying capacity of the pier caps.

So far, only twelve counties have responded to this request. Based on the information of the bridges we have received, most of them are showing no cracks in the pier caps. We are encouraging everyone to please take the time to review your bridge inventory to identify any pre 1984 designed hammerhead/ T-Pier bridges, or pier cap cantilevers that show or have inspection records of shear cracks in the cantilevers. Please send your response to Moises Dimaculangan as soon as possible.

State Bridge Engineer Update

Nancy Daubenberger served as the director of the Bridge Office and our State Bridge Engineer since 2011. She was recently appointed Director of the Engineering Services Division. She will oversee the Offices of Construction, Environmental Stewardship, Land Management, Materials, Bridge and Project Management. At this time, she envisions the State Bridge Engineer position will be filled temporarily for 6-12 months before it is filled permanently. As she transitions into her new role, she will also continue to serve as the State Bridge Engineer until it is filled temporarily. In the interim other Bridge Office Senior Managers will be providing the necessary additional support with this important transition. Nancy looks forward to expanding her involvement into the other functional areas of MnDOT.

As State Bridge Engineer, Nancy provided great leadership and support to our local agencies and other Minnesota transportation partners. Under her tenure, a lot was accomplished in the local bridge world.

- Implementing a new bridge structure information management system
- Implementing the Statewide load rating program to evaluate local bridges for special hauling vehicles
- Rehabilitation of several notable historic bridges such as the Swayback Bridge in Rock County,

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...continued, State Bridge Engineer Update



- Implementation of innovative local bridge construction including GRS-IBS abutments,
- 2012 Duluth flood recovery effort requiring an extensive bridge damage assessment, repair, and replacement program
- Construction of the iconic Hennepin County Lowry Avenue Bridge
- Inclusion of AGC bridge construction awards for local bridge contractors and owners, and over \$250M in total local bridge construction
- And many more!

She will be missed as our State Bridge Engineer, but we know in her new role, she will continue to provide that same great leadership and support so we can continue to help improve and advance the local bridge program.

2006 Bridge Asbestos Screening Tool—Do NOT Use

As you may recall back in 2006 an asbestos screening tool was developed for County Engineers and other local bridge owners. This tool worked well for many counties and consultants to screen out the necessity for spending money on a more in-depth asbestos assessment. These certified/professional assessments can sometimes be more expensive and difficult to schedule for outstate local bridge owners. Unfortunately, hazardous waste has expanded beyond the asbestos concern addressed by the screening tool. Back in 2010 during a federal audit we were informed not to use the screening tool and we proceeded by adding the item “Certified Contractor Asbestos & Regulated Waste Assessment Report” to the State Aid Bridge Plan Review Checklists.

State Aid has been contacted by the Minnesota Department of Health several times over the past few years citing local bridge owners who are apparently inadvertently still using the old screening tool. The MDH has reiterated that personnel performing an asbestos inspection are required to be certified as an Asbestos Inspector by MDH, and an individual performing an asbestos inspection without the proper certification is subject to an Administrative Penalty Order up to \$10,000.

So moving forward please make sure your bridge projects have a Certified Contractor Asbestos & Regulated Waste Assessment Report, and they follow the MnDOT Office of Environmental Services [Asbestos and Regulated Waste Manual](#) for Structure Demolitions (bridges) or Relocation for Construction Projects (Regulated Waste Manual). Also for Asbestos Abatement and Building Demolitions – verify the abatement contractor is licensed, and submits Notice of Intent to Perform a Demolition 10 days prior to demolition. Please note, building removal material must be disposed in an authorized landfill, MPCA fines may apply upon failure to do so.

Geosynthetic Reinforced Soil Abutment Bridge Update

To date Minnesota has only constructed one Geosynthetic Reinforced Soil Integrated Bridge System abutment bridge. You can visit our [2014 State Aid Bridge Newsletter](#) (PDF) to learn more about Minnesota’s GRS-IBS abutment bridge in Rock County. Regarding further implementation of GRS-IBS abutments in Minnesota, the City of Minnetonka is interested in pursuing the usage of GRS-IBS abutments for approximately 10-12 short span replacement bridges in the ‘Opus’ in 2016. The ‘Opus’ has about six miles of trails that typically cross under one-way roadway bridges that serve both residential, hotel, commercial, light industrial and office buildings in the development area. The city and their consultant, WSB and Associates, Inc. view the GRS-IBS in this application (small span bridges over pedestrian and bicycle trails) as a great way to save time and money in local bridge construction. The city is proposing to use large wet cast retaining wall blocks as the GRS facing. They like the texture and aesthetic appearance the large blocks will offer for the Opus development. We will keep you posted on this very interesting bridge replacement project that has the potential for cost savings using GRS-IBS abutments versus conventional reinforced concrete abutments.

On a national front, the FHWA is studying GRS-IBS abutment riprap protection for stream crossings. This study is being performed at the J. Sterling Jones Hydraulics Laboratory. Preliminary results of this study can be found on pages 4-5 of the USDOT Hydrologic and Hydraulic News December 2014 Vol. 2, Issue 2. Note, they observed No Failure of Countermeasure with buried full channel width riprap protection. You can find the USDOT Hydrologic and Hydraulic Newsletters on the [FHWA Resource Center, Hydraulics Team webpage](#).

Innovative Local Bridge Construction

Franklin Avenue Bridge (2015 construction project)

The rehabilitation of the historic Franklin Avenue Bridge will be Minnesota's first bridge project to use Ultra High Performance Concrete. UHPC is concrete material formulated by combining portland cement with silica fume, quartz flour, fine silica sand, high-range water reducer, water and steel or organic fibers. UHPC can provide compressive strengths up to 29,000 pounds per square inch. Ultra-high performance concretes have demonstrated exceptional performance when used as a field-cast closure pour or grout material in applications requiring the onsite connection of multiple Prefabricated Bridge Elements. This use of UHPC has gained significant momentum with other states around the country. UHPC for PBE became part of the FHWA Every Day Counts Program in 2014 which is generating interest from many owners, designers and constructors. To support UHPC, FHWA has recently published [Design and Construction of Field-Cast UHPC Connections \(FHWA-HRT-14-084\)](#).



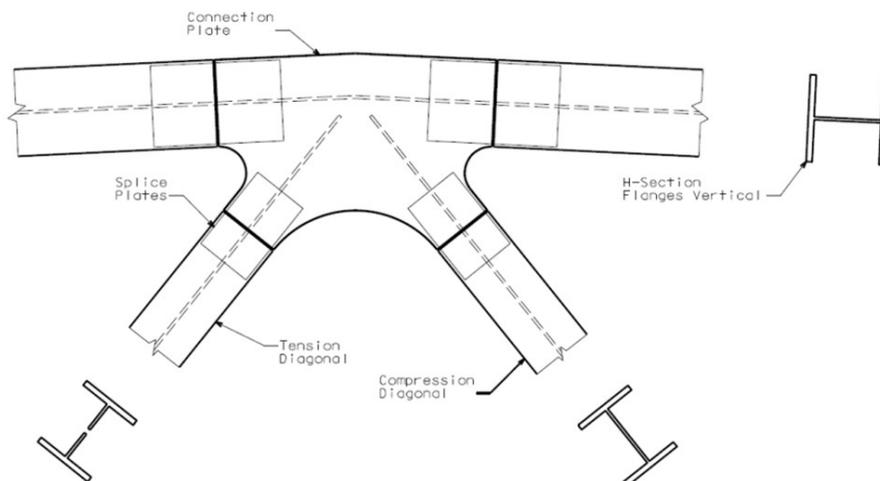
(Franklin Ave Bridge 1923 (from Hennepin County Library))

Additional information on the Franklin Avenue Bridge (bridge design team HNTB & Baker) can be found in our [2014 State Aid Bridge Newsletter](#) (PDF) and with [Hennepin County](#) Bridge Engineer Jim Archer.

North Town Bridge (2015 construction project)

The North Town Bridge will be Minnesota's first true non-fracture critical load path redundant steel truss bridge (Note a fracture critical member is defined as a steel tension member or element whose failure is expected to result in the partial or full collapse of the bridge, and load path redundancy means providing multiple main supporting members between points of support to safely carry some level of live load in a damaged condition without collapse, steel truss bridges are traditionally classified as non-redundant structures and considered fracture critical). At the request of the Bridge Office, it was required to provide a non-fracture critical load path redundant bridge system for this crossing.

The preferred alternative for the North Town Bridge was a steel truss-like main span of 305' with steel beam approach spans to replace the existing historic bridge of five shorter warren steel truss spans over the BNSF North Town Rail Yard in Minneapolis. In order to satisfy the Bridge Office, the design team needed to provide a modern truss design to achieve both load path redundancy with non-fracture critical members. This was achieved by providing both tension member redundancy and connection load path redundancy. To accomplish this, essentially the proposed top chord H section flanges are oriented in the vertical direction. This allows the truss connection plates to be in the same plane as the H section flanges, thus creating load path continuity from flanges to connection plates and back to flanges (dual plate system creates load path redundancy as each connection plate). Also, other steel tension members (truss verticals and diagonal members) and connections are provided with a direct alternate load path to provide load path redundancy and eliminate fracture critical members in the truss. See H section top chord connection concept.



(continue on page 23)

H section top chord connection concept

...continued, Innovative Local Bridge Construction

The primary challenge of a steel truss or steel truss-like structure is providing tension member redundancy to the bottom chord. To achieve this, the design team (PARSONS, ONE and SEH) opted for a highly redundant composite steel and post-tensioned concrete in compression bottom chord to eliminate the fracture critical tension member designation.



(Rendering of proposed North Town Bridge)

Additional information on the North Town Bridge can be found in our 2014 State Aid Bridge Newsletter (PDF) and with Minneapolis Bridge Engineer Jack Yuzna.

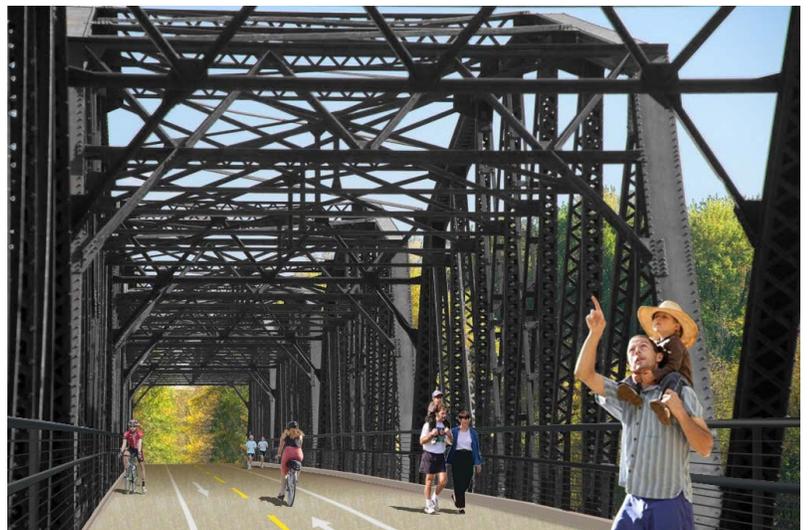
Old Cedar Avenue Bridge (2015 construction project)

The Old Cedar Bridge will be Minnesota's first local bridge to use light weight concrete for the bridge deck system. The design team SRF Consulting Group, Inc. and Modjeski and Masters evaluated a deck system with normal weight concrete and a deck system with light weight concrete. Note, light weight concrete weighs approximately 110 pounds per cubic foot compared to approximately 150 pounds per cubic foot for normal weight concrete.

This historic bridge has an existing timber deck in critical condition, and is not original or considered historic fabric. The original deck actually consisted of concrete. Therefore, a concrete deck was recommended for replacement under this rehabilitation project. Because structural analysis indicated that load rating factors are approximately 15-20 percent higher for a lightweight concrete deck over a normal weight concrete deck, and the extent of steel truss member and connection repairs could potentially be reduced, a lightweight concrete deck was recommended.

The primary disadvantage of lightweight concrete is the increased material cost when compared with normal weight concrete. In this case a lightweight concrete deck added approximately \$15,000 to the overall estimated project cost. For background information on lightweight concrete, please reference [USDOT TechBrief](#) (PDF) and the [Lightweight Concrete Highway Infrastructure](#) article by Ben Graybeal and M. Myint Lwin of the FHWA.

Additional information on the Old Cedar Bridge can be found at the [Old Cedar Avenue Bridge over Long Meadow Lake website](#).



(Rendering of Proposed Old Cedar Bridge)



State Aid Bridge

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