

# State Aid Bridge News

January 2016

(MCEA Bridge Committee at the Franklin Avenue Bridge reconstruction project with Hennepin County Bridge Construction/ Project Engineer Paul Backer)

## Contents:

- Bridge Asset Management Update (pg. 1-2)
- NBIS Compliance Headlines (pg. 2)
- Bridges and Structures Training, and Bridge Inspection Webpages (pg. 3)
- Bridge Inspection General (pg. 3)
- Bridge Maintenance (pg. 4-5)
- Bridge Hydraulic News (pg. 5)
- Local Timber Bridge Research and LRFD Bridge Design Manual Chapter 8 - Wood Structures (pg. 5-6)
- Local Historical Bridge Preservation Update (pg. 6-7)
- 2015 MnDOT Featured Local Bridge Construction Project (pg. 7)
- Box Culverts Update (pg. 7-9)
- Local Bridge Engineers Update (pg. 9)
- Local Bridge Replacement Program Update (pg. 9-10)
- Concrete Update (pg. 10)
- Quality Assurance and Quality Control QA/QC for Local Bridge Plans (pg. 10-11)
- Load Rating and Permitting Update (pg. 11-13)
- New Pile Payment Method (pg. 13)
- Bridge Costs Update (pg. 13-14)

## Bridge Asset Management Update

### National Bridge Elements Implementation

Minnesota will be transitioning to the federally mandated method of Element Level Bridge Inspections in 2016. All inspections performed on or after April 1, 2016 will be required to follow this new method. With this transition, we will see a complete overhaul to the Minnesota Bridge Inspection Field Manual, an upgraded version of SIMS, and a migration of the existing element level data. The upcoming bridge inspection seminars have been tailored to describe all of these changes in detail. The seminars have also been expanded to 10 sessions this year so that everyone is given ample chance to attend. **Please make every effort to register for one of these sessions if you are involved with bridge inspections.** See page 3 for further details and information on the training.

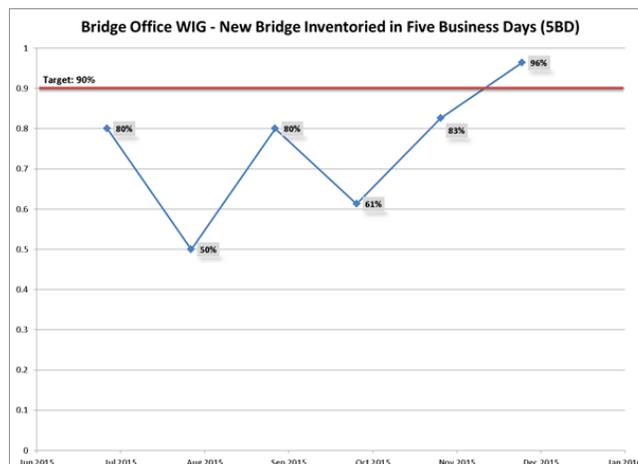
### New Bridge Entry

The MnDOT Bridge Office is striving for a five business day turnaround on new bridges entered into SIMS. To help us track this effort, all inventory change requests must start with a request from the agency with the electronic forms listed on the [MnDOT's Bridge Office, Design, construction and maintenance resources webpage](#) under "Notification for adding/removing structures to/from inventory" section.

#### Notification for adding/removing structures to/from inventory

- [Replace structure](#) - add new, remove old
- [Add new structure](#) - add new
- [Remove structure](#) - remove, no replacement
- [Rehab structure](#)

96 percent of December 2015 requests were completed within the five-business day period, here is our monthly performance thus far:



(continue on page 2)

# ...continued, Bridge Asset Management Update

## Certification of Bridge Safety Inspection Form Still Required

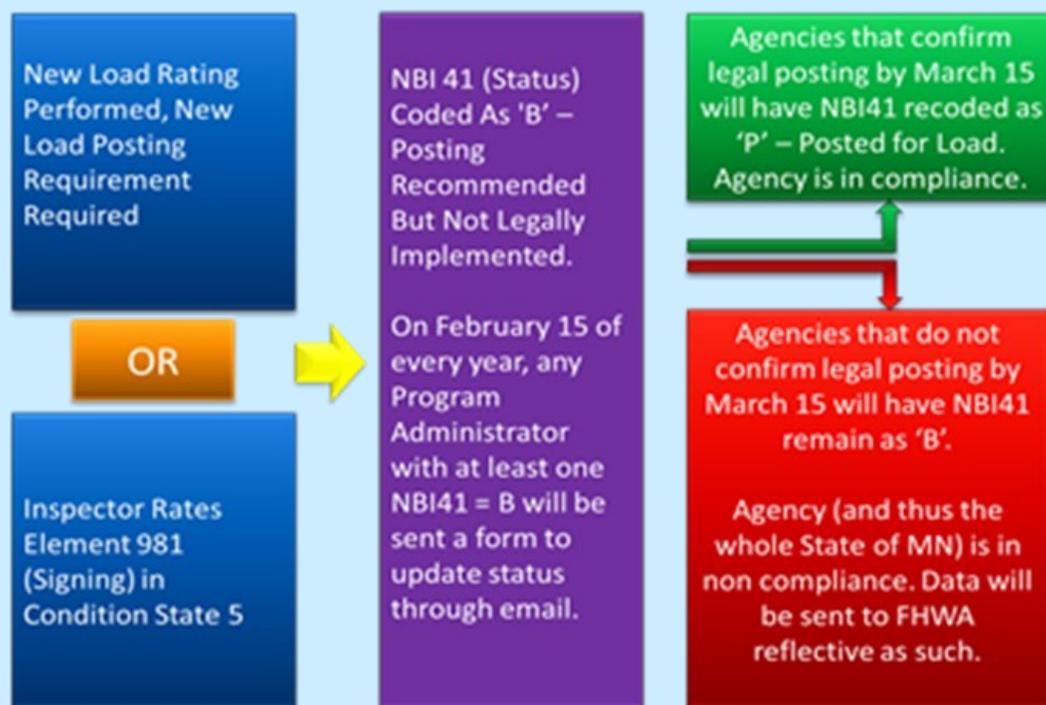
The [Certification of Bridge Safety Inspection to the Commissioner of Transportation form](#) (PDF) must be submitted no later than the close of business on February 15. This document can be signed, scanned and sent to Lisa Hartfiel at [lisa.hartfiel@state.mn.us](mailto:lisa.hartfiel@state.mn.us) as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

## 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 (NBI) 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. As of 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 marked non-compliant. 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 165.1 2, 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

If you do not meet the February 15 deadline, your agency is non-compliant 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 National Bridge Inspection Standards (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.

# Bridges and Structures Training, and Bridge Inspection Webpages

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 [MnDOT Bridge Office, 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.

Questions regarding this topic can be directed to Jennifer Zink at [jennifer.zink@state.mn.us](mailto:jennifer.zink@state.mn.us) or 651-366-4573.

## Bridge Inspection General

### 2016 Bridge Safety Inspection Refresher Training

To maintain MnDOT certification as a bridge safety inspector, program administrator or team leader, attendance is required at a minimum of two bridge inspection seminars during each four year recertification period. Note: as the 2016 seminars will cover the new National Bridge Element (NBE) condition ratings, all certified bridge inspection team leaders are highly encouraged to attend.

#### Topics

- NBE Implementation and Element Migration Process
- 2016 MnDOT Bridge Inspection Field Manual
- 2016 SIMS Updates
- Bridge Inspections - NBE Quantities and Condition Ratings

#### Training Seminar Schedule

- **2/4/16—St. Cloud** at MnDOT District 3B Headquarters, 3725 12th St. N, Saint Cloud
- **2/9/16—Mountain Iron** at Mountain Iron Community Center, 8586 Enterprise Dr. S, Mountain Iron
- **2/11/16—Shoreview** at MnDOT Training and Conference Center, 1900 County Road I West, Arden Hills
- **2/18/16—Mankato** at Courtyard by Marriott Mankato Hotel & Event Center, 901 Raintree Road, Mankato
- **2/23/16—Detroit Lakes** at Holiday Inn on the Lake, 1155 Highway 10 East, Detroit Lakes
- **2/25/16—Blaine** at City of Blaine Public Works, 1801 101st Ave. NE, Blaine
- **3/1/16—Marshall** at MnDOT District 8B, 1800 East College Dr., Marshall
- **3/3/16—Rochester** at Canadian Honker Events at Apache, 1517 16th St. SW, Rochester
- **3/17/16—Crookston** at University of Minnesota, Crookston, 2900 University Ave., Heritage Hall, Crookston
- **3/24/16—Medina** at Hennepin County Transportation Department, 1600 Prairie Dr., Medina

#### Registration Information

Registration begins at 7:30 a.m. Seminars are scheduled from 8:00 a.m. to 4:00 p.m.

The seminar fee is \$125 and includes an updated NBE Field Manual (for Minnesota), class resource book, lunch and refreshment breaks. Class space is limited and early registration is highly recommended. Register at <http://cce.umn.edu/bridge-safety-inspection-refresher-training>.

For registration questions contact Julie Schmitz, University of Minnesota at 612-624-4754 or [cceconf2@umn.edu](mailto:cceconf2@umn.edu). For curriculum questions contact Pete Wilson, MnDOT at 651-366-4574 or [pete.wilson@state.mn.us](mailto:pete.wilson@state.mn.us).

# Bridge Maintenance

## SIMS

The SIMS Maintenance Module will be available for local agencies to utilize within the new version of SIMS beginning in April 2016. Demonstrations of the current Maintenance Module are available to local agencies by contacting Sarah Sondag at [sarah.sondag@state.mn.us](mailto:sarah.sondag@state.mn.us).

## Training

Bridge Maintenance Training is also available to local agency participants. Training announcements are posted on the SALT Training and Workshops webpage under the month that they are offered. If interested, please follow the registration process outlined in the training announcement. A brief description of each class is presented below.

### Bridge Maintenance Academy I (E-learning Training)

Beginning in late spring/early summer 2016, this course will be offered as an e-learning training.

The e-learning will provide participants with an 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.

A separate notification will be sent when the e-learning module is available. There will be no cost to participate in this training.

### Bridge Maintenance Academy II (will not be offered in 2016)

In this course, 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, concrete patching and structural steel repair. The recommended prerequisite for this course is Bridge Maintenance Academy I.

Bridge Maintenance Academy II will not be offered in 2016. It is anticipated that a class will be offered in 2017. The cost to attend Bridge Maintenance Academy II is \$100.

### Bridge Maintenance Academy III (two sessions: February 8-12 OR February 22-26, 2016)

In this course, participants will be given the opportunity to construct a small single span bridge in order to facilitate bridge jacking training. As part of this exercise, participants will be able to observe experts and perform hands-on bridge maintenance tasks, such as setting elastomeric bearings, setting steel beams, fastening steel diaphragms, constructing bridge deck formwork, placing rebar, placing, finishing and curing bridge deck concrete, and installing a strip seal joint. Following construction of the bridge, participants will receive an introduction to basic bridge jacking and bearing and joint maintenance fundamentals as well as perform a bridge jacking exercise. Recommended prerequisites include Bridge Maintenance Academy I and II.

Two sessions will be held in February of 2016. The cost to attend Bridge Maintenance Academy III is \$100. Registration is available on the [SALT Trainings and Workshops webpage](#) under the month of February.



Please note that each agency is responsible for providing the appropriate safety, tool and equipment training, PPE and basic tools that are needed for participating in this hands-on academy.

### Preventive Maintenance E-learning Modules

In 2016, MnDOT will offer e-learning modules focusing on planning, equipment, materials and best practices for four typical bridge preventive maintenance activities: flushing, crack sealing, joint sealing and gland repair. Anticipated completion date for the e-learning modules is late spring. A separate notification will be sent when the e-learning modules are available. There will be no cost to participate in the preventive maintenance e-learning modules.

(continue on page 5)

## ...continued, Bridge Maintenance

### Bridge Maintenance Manual

The MnDOT Bridge Maintenance Manual is currently being updated through a consultant contract. The contract was slightly delayed and the revised manual is now anticipated in spring 2016.

## Bridge Hydraulic News

Atlas, 14 Precipitation Implementation update.

MnDOT is implementing an update to the design rainfall distribution used for Natural Resources Conservation Service (NRCS) hydrology as used in HydroCAD, TR-20, and other software applications. This update impacts design hydrographs used for ponds and other storage designs, and some design flows for small culverts. MnDOT projects should now use the rainfall distribution derived from Atlas 14 data or use the NRCS MSE-3 rainfall distribution. The NRCS Type II rainfall distribution should no longer be used.

See MnDOT's new technical memorandum, [15-10-B-02](#) (PDF), "Use of Atlas 14 Precipitation Frequency Estimates." Guidance material is available on the [Hydraulics Atlas 14 webpage](#).

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

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

### Development of Cost-Effective Timber Bridge Repair Techniques for Minnesota

This research project to provide Minnesota local Timber Bridge owner's resources of guidance for the repair of Timber Bridges was recently completed. The newly developed Manual for Repairs of Timber Bridges in Minnesota can now be found at <http://www.dot.state.mn.us/research/TS/2015/201545B.pdf>. Additionally, the research project developed a 55 minute timber bridge repair video which will be posted at <http://www.dot.state.mn.us/bridge/inspection.html>.

Thanks goes out to [The Bridge Engineering Center of Iowa State University](#), and their research team.

### Cost-competitive Timber Bridge Designs for Long Term Performance

This may be the last in a long series of valuable timber bridge research projects. Again, 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.



(Pile Encapsulation at abutment)



(Glulam Girder Bridge designed to meet AASHTO)

You can view last year's State Aid Bridge newsletter (PDF) to learn more about this exciting research effort. Also we're happy to be working closely with researchers Brian Brashaw and James Wacker of USDA Forest Service, Forest Products Laboratory and several top notch timber bridge experts, including Matthew Hemmilla of St. Louis County, Joe Litman of LHB, Inc., Travis Hosteng of Iowa State University Bridge Engineering Center and National Center for Wood, Ron Benson of Stonebrooke Engineering, Inc., and our industry experts at Wheeler.

### LRFD Manual Chapter 8, Wood Structures Update

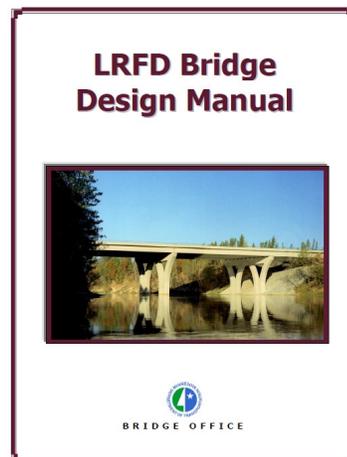
After approximately two years in the making, we're proud to say we have a timber bridge design document that now follows the 2014 and current interim AASHTO Load Resistance Factor Design (LRFD) Bridge Design Specifications and the Manual for Bridge Evaluation (Section 6). Chapter 8, Wood Structures of the MnDOT LRFD Bridge Design Manual is finally complete. The old 2003 document has been greatly expanded from 41 pages to 116 pages to include recent updates, including: wood materials/products, preservatives, decks, detailing, timber vehicular railings, and several new and updated design examples with corresponding LRFR methodology calculations.

(continue on page 6)

## ...continued, Local Timber Bridge Research and LRFD Manual Chapter 8 – Wood Structures Update

The design and associated figure and LRFR examples include: longitudinal spike laminated timber slab superstructure with timber pile cap substructure, glulam beam superstructure, transverse spike laminated deck, transverse glued laminated deck, and associated spreader/stiffener beams. All of the examples strictly follow AASHTO Sections 1 through 4 and Sections 8 through 9.

Great thanks to Ron Benson of Stonebrooke Engineering, Inc. for his endless days and weekends to provide us a high quality document. We know Ron spent a lot of pro bono time and effort to complete the project. In addition, many thanks to Stonebrooke Engineering and the State Aid Bridge Unit for their leadership, dedication, assistance and time. The Chapter 8, Wood Structures of the MnDOT LRFD Bridge Design Manual update is currently being vetted through the MnDOT Bridge Office Research and Development Committee. We anticipate the document will be posted shortly on the [MnDOT Bridge Office, LRFD Bridge Design Manual webpage](#).



## Local Historical Bridge Preservation Update

### Local Historic Bridge Study Phase III

With the completion of Phase II, we're already deep into Local Historic Bridge Study Phase III with LHB, Mead & Hunt, the 106 Group, MnDOT's Cultural Resources Unit, SALT, State Aid Bridge, USACE, SHPO, and the FHWA. Please visit the [January 2015 State Aid Bridge newsletter](#) (PDF) for a Phase II recap, and we again encourage you to visit [MnDOT's Historic Bridges website](#). This is an excellent tool to find your historic bridge information. The information includes its history and significance, location, and the valuable historic bridge report. Also, don't forget to view the December [2015 State Aid E-Scene](#) (PDF) and read more about the historic Dodd Ford Bridge rehabilitation project from Blue Earth's County Engineer, Alan Forsberg.

The Phase III study was developed to examine websites such as [Bridgehunter.com](#) to confirm that there are no other Warren and Pratt Through Truss bridges that have not been identified and evaluated for historic eligibility. During the Phase II study, it was noted that the criteria for Warren and Pratt Through Trusses was developed over 30 years ago when these bridge types were quite common, and that the "Historic Iron and steel Bridges in Minnesota, 1873-1945" excluded these bridge types.

The Phase III study will include field visits and bridge reports for up to 33 additional bridges. Like Phase II, the reports will include: engineering or geometric issues, accident history, character-defining features, the identified stabilization, preservation and maintenance needs, and recommended timeline for completing the stabilization, preservation and maintenance needs. The Phase III effort will also prepare Historic American Engineering Record (HAER) documentation for up to 15 bridges that have little chance for rehabilitation, either due to owner disinterest, inability to be relocated, deteriorated condition, or for bridges that are good candidates for relocation, so they can be documented in their current location. The Phase III study culminates with a 3 video set for posting on [MnDOT's Historic Bridge website](#) regarding local bridge preservation efforts.

### Statewide Historic Bridge Preservation Program

Along with Phase III work, efforts have been initiated to develop a statewide historic bridge preservation program to fund the high cost maintenance, stabilization (stopping or slowing further deterioration), preservation (treatment measures taken to sustain the integrity and material of the bridge), or rehabilitation (extensive construction repairs to extend life and function of the bridge) of Minnesota's historic bridges. Approaching the legislature with a proposal seemed timely, with the completion of Phase I and Phase II historic bridge studies.

*(continue on page 7)*



*(Shoring towers and support systems for historic Old Cedar Avenue Bridge. Learn more about the project status on the [Old Cedar Avenue Bridge website](#))*

## ...continued, Local Historical Bridge Preservation Update

We see a need to assist bridge owners with incentives to invest time and resources to ensure all Minnesotans can benefit from the preservation of Minnesota's historic bridges. The responsibility of the bridge owner should be shared with the responsibility of the entire state to preserve and rehabilitate our historic heritage for the benefit of all. As proposed, the historic bridge preservation program will encourage and emphasize the importance of historic statewide preservation of historic bridges through a dedicated funding source which will hopefully be used to leverage other funding short falls and resources. Note, multiple collaborators and supporters of this program include multiple MnDOT offices, Minnesota county engineers, Minnesota city engineers, the Township Association, FHWA, SHPO, and Minnesota consultants. We will keep you posted with more specific details as to how this legislative proposal progresses through the 2016 legislative session.

## 2015 Featured Local Bridge Construction Project

This year we would like to highlight a local bridge construction project that captures innovation, complexity, appearance, workmanship, quality and safety. The featured bridge that meets these attributes is bridge 69A18, located on CSAH 89 over Keene Creek. This bridge was a 2015 nominee for both the AGC Bridge Construction Award and APWA Minnesota Chapter Public Works.

The construction of bridge 69A18 was part of the larger CSAH 89 reconstruction through the heart of Duluth's western neighborhoods. There is 450 feet of vertical grade change from end to end of the project. At the bridge site, the ravine is very steep and the existing side slopes approached vertical in some locations. Retaining walls were built adjacent to the bridge to correct these steep slopes. The bridge incorporated concrete texture on the substructures and adjacent retaining walls to impart a natural look. A random stone pattern bookended with ashlar stone pattern pilasters wraps both abutments and continues up the hill along the new cast in place concrete retaining walls.



(St. Louis County Bridge 69A18, CSAH 89 over Keene Creek)

Since the height of the proposed roadway alignment would be over 40 feet above the creek flow line, the newly released standard MnDOT 96" MW shape prestressed concrete beams were used. With ample clearance, hydraulic performance was not a controlling design factor and the single span arrangement eliminated the need to construct a pier in the rugged, rocky ravine. At the time of its construction, bridge 69A18 was the longest single span prestressed beam bridge in Minnesota at 188' end to end. The proposed grade of the roadway profile at the bridge site was 6.5 percent, and with 8 foot deep beams on a steep slope, the top of the 96" beam is about 6" away from the bottom of the beam. Since prestressed beams come with square ends, their standard details had to be modified in order to accommodate the site.

In the end, the new bridge structure accomplished a project goal of unobtrusively restoring public access and fish and wildlife habitat to the Keene Creek ravine. Pedestrians are accommodated on the deck with a dedicated sidewalk and the Superior Hiking Trail passes beneath the bridge and in front of the north abutment.

## Box Culverts Update

### Precast Concrete Box Culvert

In October 2015 the culvert standards were updated to reference the correct concrete mix designation to match 2016 MnDOT Standard Specifications for Construction, see Precast Concrete Box Culverts section on the [MnDOT Bridge Office, Culvert webpage](#). Note, even though the precast concrete mix numbers shown on the standards now match the 2016 construction specs, along with some other minor updates (reworded construction notes in active voice), the fabricators will have no problem using them with the 2014 construction specs.

If you desire to have these culvert standards provided in AutoCAD version 2004 or later, please contact State Aid Bridge. Again, we would like to thank WSN Consulting Engineers for converting these drawings from MicroStation to AutoCAD format. 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.

(continue on page 8)

## ...continued, Box Culverts Update

Please recall State Aid technical memorandum, 15-SA-01 (PDF) "Implementation of MnDOT Standard Specifications for Construction, 2016 Edition." This memo states that all State Aid and federal aid funded local projects should use 2016 MnDOT Standard Specifications for Construction and associated 2016 MnDOT standard plans and details with bid openings on or after August 1, 2016, or in which construction activities are to begin in 2017 or later. Note, to keep on pace with the Bridge Office, who has been using the 2016 specifications for several months now, we are encouraging our local bridge consultants to start using the 2016 specifications for all bridges in preliminary design.

### **Precast Concrete Box Culvert General Plan and Elevation Template Drawing**

The Bridge Office is currently developing a general plan and elevation (GP&E) MicroStation template drawing for local highway bridge culvert projects. The template drawing will serve to indicate the minimum required plan information so that all new local bridge culvert plans can be clearly interpreted to place into SIMS. Unfortunately, many times it becomes difficult and time consuming for bridge data management personnel to determine the correct culvert fill depths from the provided GP&E sheet.

In light of this, to be consistent with MnDOT's LRFD Bridge Design Manual, and to better assist local bridge owners with managing their culvert inventory, load rating, and overweight permit information into the future, we're advising all new local bridge culvert projects to now include a Design Data Box on the GP&E sheet. The Design Data Box will indicate the design specifications, minimum and maximum fill depths, bridge operating rating factor, design speed, ADT, etc. The values in the Design Data Box can be quickly entered into SIMS.

The format of this important Design Data Block will be shown on the GP&E template drawing. The template drawing should be available on the MnDOT Bridge Office, Culvert webpage in a few months. Again, if you desire to have this template drawing provided in AutoCAD version 2004 or later, please contact State Aid Bridge.

### **Special Precast Concrete Box Culvert Sizes**

MnDOT's Precast Concrete Box Culvert Standards have a maximum span of 16 feet and maximum fill height of 16 feet. If a local bridge owner desires to use a span greater than 16 feet and/or a fill height that exceeds current MnDOT Standards, we advise you to work with your local bridge consultant, fabricator, and the MnDOT Bridge Office Standards Unit for a custom design. Upon request, our Minnesota fabricators can fabricate culvert sections with spans of 18 to 20 feet. However, when possible, continue to use the available sizes listed in the MnDOT's Precast Concrete Box Culvert Standards. Odd culvert sizes and large culvert spans typically cost more to fabricate and install. Keep this in mind as you develop your bridge culvert project.

### **Multiple Lines of Precast Concrete Box Culverts**

Local bridge owners are often faced with deciding between a bridge structure and multiple lines of culverts when preparing bridge replacement projects. When considering life cycle costs, speed of construction, design costs, a lower profile, etc., the culvert bridge is by far the bridge structure of choice for most local bridge owners. However, items that limit the use of culverts, especially multiple lines of culverts typically include site specific debris problems, initial bridge construction cost and available bridge funding, and specific requirements required by permitting agencies.

When distributing available state and federal bridge funds to local bridge owners, the low cost bridge for the bridge site is generally considered. This allows the available bridge funding to stretch further and to reach more owners with bridge replacement needs. In the case of multiple lines of culverts, cost studies have generally shown that a bridge structure competes well with a three line culvert system, and is low cost compared to four or more lines of culverts. But note, a lot of what's decided may be site specific. For example, four lines of culverts under a township road with small shoulders will cost less than four lines under a high volume CSAH with large shoulders which results in extra culvert barrel length and more dollars.

However, in general, a four line culvert system will be more expensive than a bridge structure.

When your bridge site calls for three or more lines of culverts, a bridge cost study is typically prepared by your bridge consultant. The studies will indicate the low cost bridge, advantages/disadvantages of the other bridge options studied, and will help you determine what may or may not be eligible for state and federal bridge funds.

If a bridge owner elects to choose a higher cost multiple line box culvert system over a lower cost bridge structure, that is clearly a fine choice, but just be cognizant that additional local funds will be needed. For example, a local bridge owner may prefer to use five lines of culverts in a low to no debris site instead of a three span continuous concrete slab bridge. Again, other reasons for this selection in a multiple line culvert system may be reduced maintenance costs, safety inspection costs, design costs, longer bridge life, etc. These are important items that will justify using more local funds for your bridge project.

### **Flood Plain Box Culverts**

Over the past several years, more consideration and scrutiny has been placed on both sizing and placement of box culverts at road/river intersections to improve channel and floodplain function. A detailed study of this topic prepared by the DNR can be found at <http://files.dnr.state.mn.us/eco/streamhab/geomorphology/reducing-riior.pdf>. The primary requirement of this design concept is to provide culvert cross sectional area spaced evenly across the flood

*(continue on page 9)*

## ...continued, Box Culverts Update

plain in addition to the culvert/bridge openings in the river channel. This configuration supposedly reduces the potential of Flood Flow Confinement (a flood plain constriction that impedes water and sediment conveyance) from typical overwide on-channel culvert/bridge openings.

Noted challenges for the local bridge owner with implementation of this concept include funding the additional culverts in the flood plain, adding additional bridges/structures to their inventory, potential for floodplain culverts to eventually silt in or plug up with debris, or to pass unwanted flow into adjacent lands. Also, effectively modeling for on-channel with floodplain openings can require expensive 2D hydraulic analysis. Lastly, not all topography is conducive to direct /allow flow through culverts in the flood plain.

The DNR is taking a harder look at these situations, particularly when a bridge is replaced. In some cases the DNR permits have been denied for the bridge replacement unless floodplain culverts are incorporated. Regardless of the situation, this issue continues to be problematic for some local bridge owners. At this point, plans are in motion for the Minnesota County Engineer Associations' Environmental Committee to address the issue with the DNR and MnDOT. We're hopeful that a statewide agreement can be reached between all parties, and within their boundaries of authority/jurisdiction.

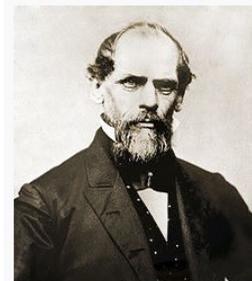
## Local Bridge Engineers Update

We're happy to announce some changes in our local bridge community. First, Ron Benson now serves as the Bridge Engineering Manager for Stonebrooke. Ron joined Stonebrooke in March 2015 to build and oversee their bridge design services. Ron has 25 years of experience in bridge design, inspection, and load ratings for many types of bridges, including concrete, steel and timber. He has been a leader and a reliable local bridge engineer for our local bridge owners. For more information, please visit [www.stonebrookeengineering.com](http://www.stonebrookeengineering.com).

Second, Jim Archer is now working for Bolton and Menk, Inc. to build and expand their bridge design capabilities and services. Formerly, Jim held important local bridge design roles at WSB and Associates, and was the Hennepin County Bridge Engineer where he was instrumental in developing the rehabilitation plans for the historic Franklin Ave Bridge over the Mississippi River. Jim also gave his time and talents to the County Engineers Bridge Committee and participated on several MnDOT consultant selection committees, and was helpful in advancing Ultra High Performance Concrete and Accelerated Bridge Construction for the Franklin Ave. Bridge. For more information, please visit <https://www.bolton-menk.com/about-us>.

Lastly, Jake Bronder has recently accepted a position leading the Hennepin County Transportation Department's Bridge Design Unit. In this role, he will oversee the design, rating, and inspection of the county's 147 bridges. Jake comes to the county with over 17 years of experience in the planning, design, inspection, and maintenance of bridges throughout the state having worked for both public agencies and consultants. His most notable bridge projects include the Lowry Avenue Bridge over the Mississippi River in Minneapolis and the Jim Oberstar Causeway Bridge in Grand Rapids. He also held important positions in the MnDOT Bridge Office, and recently worked for HDR, Inc. We look forward to Jake's experience and knowledge to further advance Hennepin County's local bridge program. For more information, please visit <http://www.hennepin.us/business#work-with-henn-co>.

John A. Roebling



circa 1866

*(A top ten famous Bridge Engineer. Bridge Projects include the 1883 Brooklyn Suspension Bridge.)*



*(Jacob Bronder, Hennepin County Bridge Engineer)*

## Local Bridge Replacement Program Update

The 2015 legislature appropriated \$7.41 million for the Local Bridge Replacement Program (LBRP) HF No. 2 from the bond proceeds in the state transportation fund. This funding will be used to leverage local and federal funds for the replacement of 13-15 bridges statewide.

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 DSAE. There may be an opportunity to fund a few additional bridges with state transportation funds this spring or summer if the selected 2015 bridges have bids under or close to their estimates. The waiting list has approximately 80 bridge projects that are either approved or in progress requesting \$24 million in bond funds with an estimated total replacement cost of \$53 million.

### Summary of Bond Funds

In 2015, 176 local bridges were funded for replacement, rehabilitation, or removed at a total cost of \$65 million. This included \$3 million in federal funds, \$21 million in state aid funds, \$17 million in town bridge funds, \$9 million in bond funds and \$14 million in local funds. Township bridges accounted for 79

*(continue on page 10)*

## ...continued, Local Bridge Replacement Program Update

of the 176 projects.

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 [LBRP webpage](#). This information helps demonstrate the need and justification for funding the LBRP in the upcoming legislative session.

### Summary of Bridges Planned but Not Constructed

Counties and cities pass resolutions identifying their five year replacement priorities for bridges on the local system. These priorities are used to demonstrate the need for legislative support of LBRP and state transportation funding from bond proceeds appropriated through a bonding bill. State Transportation bond funds leverage other local and federal funds for the replacement of bridges throughout the state. Approximately 400 bridges have been identified by cities and counties for replacement over the next two years at a total replacement cost of \$330 million. For more information regarding the local bridge program go the [LBRP webpage](#).

## Concrete Update

### Contractor Mix Designs

To start we would refer you to the December State Aid E-Scene (PDF) where there's an informative article on the Implementation of Concrete Contractor Mix Designs. Regarding local bridges, new bridge projects for 2016 construction and beyond are already being prepared with contractor mix designs and high performance concrete mix designs for concrete bridge decks. The Concrete Office and the Bridge Office have been working hard with industry since as early as 2010 to develop pilot projects, guidance, mix design forms, specifications, pertinent special provisions, etc. to make this all happen.

The idea behind contractor mix designs is to transition to cost effective performance based mixes. It transfers the responsibility of designing concrete mixes to the contractor and producers to produce a high quality/performing mix that meets all of the basic criteria set forth in the specifications. It also allows the contractor and producers more flexibility to use supplementary cementitious materials and admixtures. The engineer determines final acceptance of the concrete for payment based on satisfactory field placement and performance.

To help local bridge owners and local bridge consultants with implementing contractor mix designs, the Concrete Office has developed key contact information to provide the necessary assistance. Regarding cast-in-place concrete for bridge construction contact Ron Mulvaney at [ronald.mulvaney@state.mn.us](mailto:ronald.mulvaney@state.mn.us). For precast concrete bridge elements, e.g. box culverts, prestressed concrete beams, contact Steve Grover at [steve.grover@state.mn.us](mailto:steve.grover@state.mn.us). Detailed contact information can be found on the [Concrete Engineers Contacts webpage](#). Please note, MnDOT will continue to design concrete mixes for carryover projects in 2016, but plans to only approve mix designs with the start of the 2017 construction season.

### High Performance Concrete

The MnDOT High Performance Concrete (HPC) Committee has been working hard to pull together the necessary specifications, information, and resources to implement HPC bridge decks for local bridges. Why use a HPC bridge deck? Because HPC is cost effective (cheaper by approximately 10 percent, uses less costly cement and takes advantage of new admixtures and pozzolans such as silica fume or fly ash), proven to reduce deck cracking and will enhance overall concrete durability.

Although we're already seeing new local bridge plans being developed with specifications for HPC bridge decks, we want to further encourage all local bridge owners to consider using HPC for their new bridge decks. However, before HPC is specified we advise your bridge consultants to first make sure HPC can be adequately produced and delivered to the proposed bridge location. HPC may not be appropriate for bridges in remote locations. In the Transport pay item list you'll see bridge slab concrete with a designation 3YLCHPC. This is our low cement or Kansas mix. We use it for more remote areas with smaller concrete plants as this does not require any special bins, admixtures or mix design submittals. Extra vibrators are needed for this deck pour as there is less cement and water. However, we still encourage you to work with the MnDOT Concrete Unit, expert contact Ron Mulvaney at [ronald.mulvaney@state.mn.us](mailto:ronald.mulvaney@state.mn.us) to determine the availability of HPC for your specific project.

Note, the HPC Bridge Decks (Contractor Concrete Mix Design) special provision is now available and can be found in the Division "SB" bridge special provisions on the [Bridge construction webpage](#). Also the Transport pay item list has been updated and can be found on the [Bid Letting webpage](#).

## Quality Assurance and Quality Control QA/QC for Local Bridge Plans

It is a good time to discuss quality management for local bridge structures, especially in a time where budgets and work forces are typically running very streamlined. Along with this fact, State Aid Bridge can see up to \$100 million in bridge construction plans and over \$1.5 million in special consultant contracts annually. Therefore, State Aid Bridge relies heavily on a high level of quality in all calculations, plans, and reports prepared by local bridge consultants.

*(continue on page 11)*

## ...continued, Quality Assurance and Quality Control QA/QC for Local Bridge Plans

State Aid Bridge approaches their plan and report reviews assuming that all received products and deliverables have been fully QA/QC'd by the consultant first. Although we provide spot design and plan checks of the consultant's work, we simply do not provide services to fully check the design, plans, and reports. Simply stated we do not serve to be the consultant's checker. With that said, we're happy to report that a majority of the consultants serving our local bridge owners are very diligent in making sure their quality management plan process is fully at work when delivering plans and reports for State Aid Bridge review. However, there are occasionally plans and reports that come through our office that suggest the QA/QC process was lacking. This in turn causes delays in our reviews and often results in untimely and unnecessary rework.

As we move forward, we ask that all consultants continue to maintain a high priority on QA/QC for local bridges with the goal to produce plans that are designed free of errors and omissions, designs are complete and thorough and conform to policies and procedures defined in the relevant MnDOT manuals, and pertinent guidelines on the MnDOT website. Please revisit the [MnDOT LRFD Bridge Design Manual](#) Section 4.1 and past bridge workshop presentations regarding this subject. Also, please see MnDOT's current [Guidelines for Checking Final Design Bridge Plans](#) (PDF).

State Aid Bridge thanks the great professionals we have in our Minnesota Local Bridge Consultants, and the great work they have been accomplishing over the years.

## Load Rating and Permitting Update

### SHV Load Rating Contract Update

As we continue our efforts in updating our local bridge load rating inventory, and to fulfill the requirements of the National Bridge Inspection Standards (NBIS) Code of Federal Regulation 650.313 and the [Minnesota Statutes 165.03](#), the statewide SHV load rating contract is now in its fifth phase and is well underway. This time, there are approximately 930 local bridges that are in need of new load rating. Due to the extremely high number of bridges, we divided the contract into six separate local bridge consultant contracts. The team of consultants includes Erickson Engineering, LHB, SEH, SRF, WSB, and WSN.

Minnesota legislatures have in recent years, passed the six-axle and seven-axle annual permit vehicles to transport raw or unprocessed agricultural products. These newer axle configurations are much heavier than SHV's and therefore considered likely that they may be overstressing some of our local bridges. In response to changing truck configurations and their potential for overstressing shorter span bridges, the current SHV load rating contract and future SHV load rating contracts will analyze local bridges for the 6-axle 90,000 GVW and 7-axle 97,000 GVW annual trucks that require permits. Both annual permits can have a maximum GVW of 99,000 lbs. during winter weight increase season.

To date, under SHV contracts 1-4, we have completed the load rating evaluation of approximately 3,000 local bridges of which ~2500 are now in AASHTOWare BrR (formerly Virtis).

All bridges will be load rated in accordance with the AASHTO Manual for Bridge Evaluation (MBE). To standardize load ratings and improve quality control and oversight, the SHV contracts require that bridges be evaluated using AASHTOWare BrR as the main tool for load rating analysis. This program, developed by AASHTO, is in accordance with the AASHTO MBE. It allows the bridge owner to store detailed bridge descriptions sufficient for structural analysis. It's a powerful tool with many user and agency benefits.

Due to the addition of available federal funds, State Aid Bridge is arranging to possibly add approximately 700 local bridges to the current SHV load rating contract five. As of now, the bridge list is currently being developed.

For future contracts, we have secured \$1 million each for contract six and seven and are expecting to have roughly 800 bridges for each. This should take us all the way to FY 2018 and by that time we would have evaluated approximately 6,200 local bridges and have met the FHWA SHV bridge posting requirement for 2017. (Please reference the 2015 State Aid Bridge newsletter (PDF), note the FHWA defines a bridge/culvert as having a total clear span length of 20 feet or greater).

### Overweight Permitting Update

There is a strong interest in having an enhanced and uniform statewide overweight permitting process between MnDOT and local government. The idea is to adapt to the current MnDOT permitting process. There are two areas in overweight permitting that we need to put more emphasis on, one is the process in ordering overweight permits that include MnDOT owned bridges on roads that are controlled by local agencies. There are approximately 645 MnDOT bridges on local routes over Trunk Highway and interstate. This includes 399 MnDOT bridges that reside in the metro area. The issue with this process is that there is no coordination between MnDOT and local government when it comes to permit application and it

*(continue on page 12)*

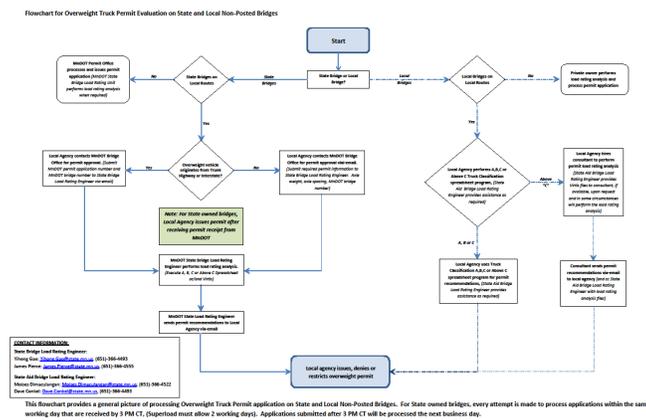
## ...continued, Load Rating and Permitting Update

is not clear as to who should be granting the permits. The other area of interest is a permitting process that only applies to local bridges. Currently, counties have different ways of doing overweight permitting. Sometimes this involves analysis, sometimes not, and sometimes it involves MnDOT State Aid Bridge to provide assistance. As a result, there is no standard way of processing the permit application on the local end.

To address the issues stated above and to have a consistent operating procedure for the application of overweight/oversize vehicle permits on the Minnesota local roadway system, State Aid Bridge, with the support from MnDOT Bridge, Dakota County, Hennepin County, Douglas County, Ottertail County, and St. Louis County (these counties were selected because they have the most number of MnDOT bridges on their routes) developed a flowchart to handle permitting MnDOT owned bridges that are on local routes. This process will require MnDOT to be actively involved in providing permit recommendations.

State Aid Bridge then adapted the flowchart to account for permitting local bridges on local routes as well, and in order to have a uniform/consistent local permitting process statewide (see proposed flowchart below). Note, State Aid Bridge will continue to work with the County Engineers Oversize and Overweight, and Bridge Committees to produce a final flowchart version.

If approved, this will be a great initial tool/flowchart to assist local agencies with their overweight permit decisions. As we continue to populate local bridges into AASHTOWare BrR, this tool will become even more useful. Also, as the tool gets more widely used by local bridge owners, bridge consultants, etc. we can see the possibilities of mapping specific permit routes, and other enhancements to make this process easy and uniform across the state.



[\(Click here to view the a full page version\)](#)

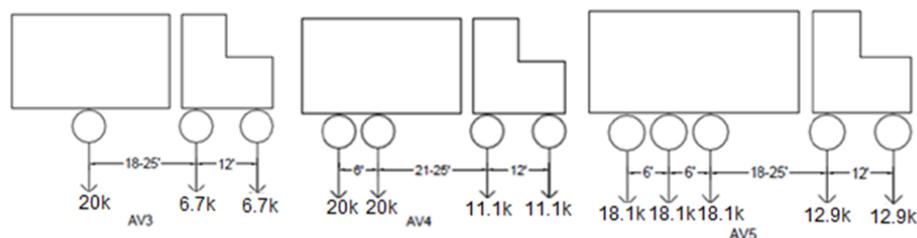
## Implements of Husbandry Pooled Fund Study Update

To receive maximum benefits from this study, MnDOT has joined forces with six others states in the upper midwest that have the same concerns about the effects of heavy farm equipment (Implements of Husbandry) on bridges. This pooled fund study is sponsored by MnDOT, Illinois, Kansas, Nebraska, Oklahoma, Wisconsin, and Iowa DOT with Iowa State University Bridge Engineer Center (the primary investigator). It's a five year research contract that began in 2011.

The objectives are to determine, thru physical testing and computer modeling, how farm equipment distributes their loads within a bridge. Also, to provide recommendations for accurately analyzing bridges for farm equipment. As stated in the [2015 State Aid Bridge newsletter](#) (PDF), the proposed generic vehicles that they felt were most representative of the farm vehicles used are well above the legal weight limit on bridges in Minnesota, therefore it is 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 and load posting limitations provided in [Minnesota Statutes 169.824](#) and [Minnesota Statutes 169.84](#).

The research team then moved to develop possible legal farm vehicles that could be used for load rating and posting purposes in Minnesota. Below are the possible generic Minnesota legal farm vehicles that are being proposed.

(continue on page 13)



## ...continued, Load Rating and Permitting Update

On a national level, we're pleased to announce that Moises Dimaculangan was selected to serve as an official panel member for the [NCHRP Project Number 12-110, Proposed New AASHTO Load Rating Provisions for Implements of Husbandry](#).

### Bridge Load Rating Forms Update

When filling out load rating forms, it is important to use the most current version of the forms that are available. Always check the [Bridge rating and data management webpage](#) before completing these forms to verify that you have the latest version. Please note that MnDOT Bridge revises the load rating forms from time to time. In any event, if you have questions, please contact State Aid Bridge Office or the MnDOT Bridge Office.

## New Pile Payment Method

The Bridge Office is moving to a new pile payment method. They have successfully completed 3-4 Trunk Highway pilot bridge projects using this new pile payment method, and all indications suggest that it is working very well. They have another 6-8 pilot bridge projects in the works and they have been working closely with the Associated General Contractors of Minnesota on this new pile payment method. As you may know, both pile delivered and pile driven had been the basis for pile payment in the past. Many times, we see a contractor place the majority of their bid in the delivered payment item, and leave a very little bid for the driven pay item. For example, the delivered price maybe \$40/ft., and the driven price will be just a \$1/ft. This can result in an unbalanced bid, and in turn provides less incentive for a contractor to drive pile beyond that which is needed for minimum bearing. Bear in mind, the final pile length authorization can sometimes be set beyond the minimum bearing depth to fully assure that a conservative and sound pile bearing is achieved.

To prevent this undesirable situation for the bridge owner, the new pile payment method will only pay for the actual number of lineal feet of piling complete (furnished and installed) in the ground. This new payment method promotes quicker pile installation by eliminating the need for pile length authorization from the Bridge Office, simplifies inspector and administrative time tracking pile splices, pile cutoffs, pile adds, etc.

Note, the test pile pay item will still be used; it will include mobilization and demobilization for pile driving operations costs. If the quantity of furnished and installed piling is less than the plan quantity or the quantity as ordered by the engineer, the department/owner will pay 50 percent of the cost to re-stock unused piling if the contractor elects to re-stock piling and provides a paid invoice showing the re-stocking fee. Payment for the department's/owner's portion of the restocking fee will be made as a backsheet item under "Piling, Restock" superseding any claims due from spec 1907, "Payment for Surplus Material."

The Bridge Office has developed a special provision for this new pile payment method. On the [Bridge Construction webpage](#) please see 2016 "SB" Bridge Special Provisions ([PDF 2 MB](#), [Word 2 MB](#)), Section SB2016-2452.2. At this time, we encourage local bridge owners to use this new pile payment method, especially for local bridges at sites with more predictable and reliable geology both above and below scour depth, the geotechnical evaluation and report for the bridge site is conclusive, etc. This new payment method puts more risk on the contractor and more incentive to bid the pile properly. So for those bridge sites where geology is very uncertain, we would advise to use the old pile payment method with the delivered and driven pay items. However, the new pile payment method appears to be moving towards the payment method of choice for all bridge locations.



## Bridge Costs Update

Calendar year 2015 saw a moderate unit cost increase for PCB type structures and a small unit cost decrease 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.

(continue on page 14)

## ...continued, Bridge Costs Update

We also let a single INV-T (prestressed Inverted T Beams) bridge in CY 2015, which came in at about \$290/sf. We let 6 steel pedestrian TRUSS structures in CY 2015 and their unit cost was moderately up 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.

We let a notable bridge as well this year. We let a vehicular steel truss bridge on St. Anthony Parkway in the City of Minneapolis (on the Grand Rounds road network). Normally truss bridges aren't allowed (they are fracture critical), but this bridge was a load path redundant bridge. It came in at \$457/sf.

We also added a new structure type to the report this year, Pedestrian Boardwalk (BRDWLK). We've built these in the past but they were so sporadic that we didn't track them. It seems they are building more trails these days (and we let 5 boardwalk structures in CY 2015), so we decided to start tracking them. The average cost for these 5 boardwalks were \$53/sf.

There was a slight increase in the number of C-SLAB bridges compared to CY 2014 (12 let in CY 2015 vs. 11 let in CY 2014). There was a slight decrease in the number of PCB bridges compared to CY 2014 (21 let in CY 2015 vs. 23 let in CY 2014). The unit cost percentage increases/decreases are shown below.

- PCB structure costs were up 11 percent (\$136.58/sf in CY 2014 vs. \$151.93/sf in CY 2015)
- C-SLAB structure costs were down 1 percent (\$123.08/sf in CY 2014 vs. \$121.49/sf in CY 2015)
- TRUSS pedestrian structure costs were up 21 percent (\$243.64/sf in CY 2014 vs. \$293.89/sf in CY 2015)



We replaced approximately 50 timber bridges and 4 fracture critical bridges in CY 2015. 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 2015, 29 of them were replaced with concrete box culverts, 7 were replaced with C-SLAB bridges, and 14 were replaced with PCB bridges.

Of the 4 fracture critical bridges replaced in CY 2015, 2 were replaced with C-SLAB bridges, 1 with a PCB bridge, and 1 with a STEEL (load path redundant) vehicular truss bridge.



# State Aid Bridge

MnDOT Bridge Office  
3485 Hadley Ave N., MS 610  
Oakdale, MN 55128

<http://www.dot.state.mn.us/stateaid/bridge/>

#### Contacts:

**Conkel, Dave**  
[dave.conkel@state.mn.us](mailto:dave.conkel@state.mn.us)  
State Aid Bridge Engineer  
651-366-4493

**Homan, Brian**  
[brian.homan@state.mn.us](mailto:brian.homan@state.mn.us)  
State Aid Bridge Plans Engineer  
651-366-4494

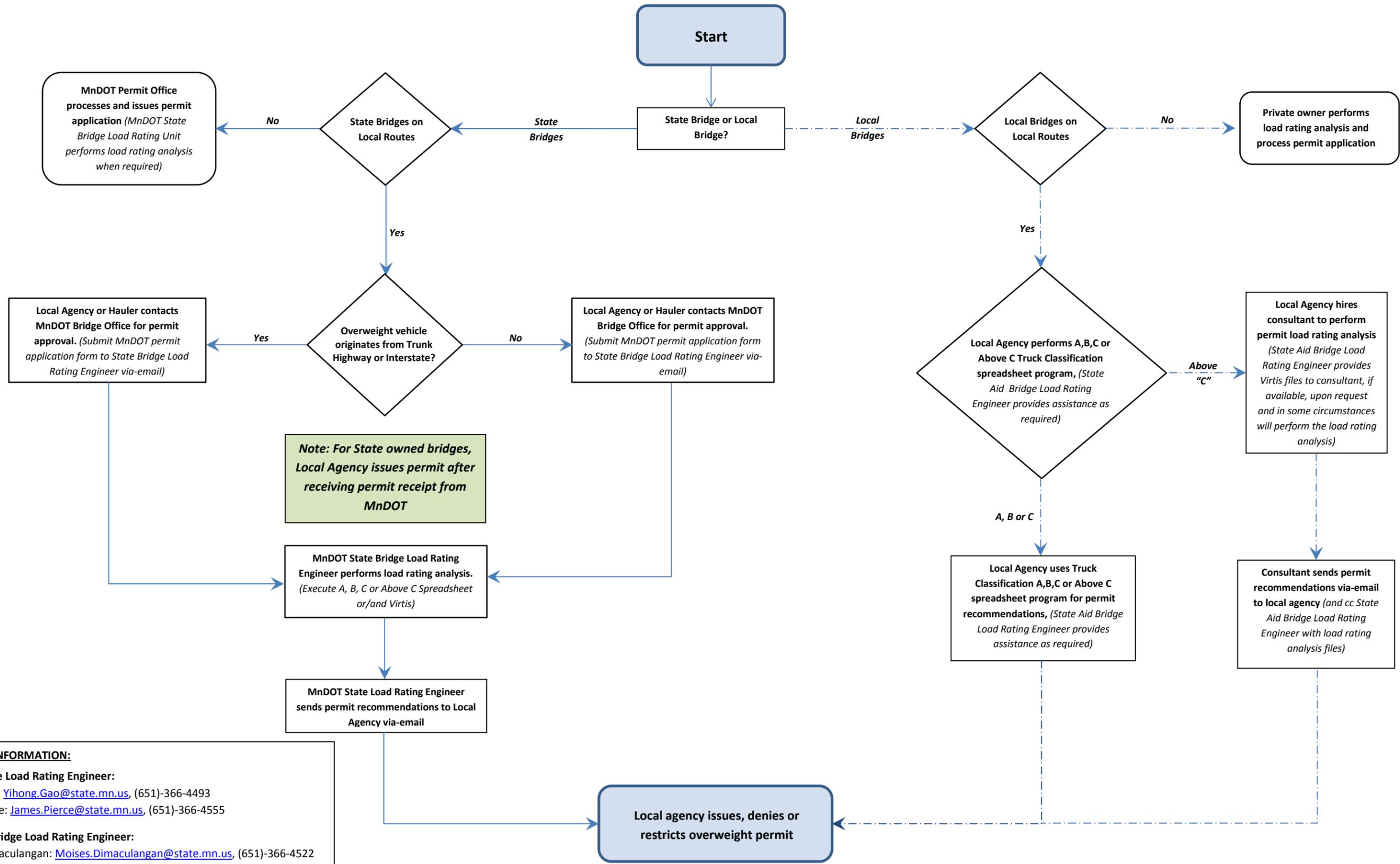
**Dimaculangan, Moises**  
[moises.dimaculangan@state.mn.us](mailto:moises.dimaculangan@state.mn.us)  
State Aid Bridge Load Rating & Permitting Engr.  
651-366-4522

**Brown, Steve**  
[steve.brown@state.mn.us](mailto:steve.brown@state.mn.us)  
State Aid Bridge Sr. Bridge Plans Specialist  
651-366-4495

**DeWall, Petra**  
[petra.dewall@state.mn.us](mailto:petra.dewall@state.mn.us)  
State Aid Bridge Hydraulics Engineer  
651-366-4473

**Pray, Trenton**  
[trenton.pray@state.mn.us](mailto:trenton.pray@state.mn.us)  
State Aid Graduate Engineer  
651-366-4548

**Flowchart for Overweight Truck Permit Evaluation on State and Local Non-Posted Bridges**



**CONTACT INFORMATION:**  
**State Bridge Load Rating Engineer:**  
 Yihong Gao: [Yihong.Gao@state.mn.us](mailto:Yihong.Gao@state.mn.us), (651)-366-4493  
 James Pierce: [James.Pierce@state.mn.us](mailto:James.Pierce@state.mn.us), (651)-366-4555  
**State Aid Bridge Load Rating Engineer:**  
 Moises Dimaculangan: [Moises.Dimaculangan@state.mn.us](mailto:Moises.Dimaculangan@state.mn.us), (651)-366-4522  
 Dave Conkel: [Dave.Conkel@state.mn.us](mailto:Dave.Conkel@state.mn.us), (651)-366-4493

**This flowchart provides a general picture of processing Overweight Truck Permit application on State and Local Non-Posted Bridges. For State owned bridges, every attempt is made to process applications within the same working day that are received by 3 PM CT, (Superload must allow 2 working days). Applications submitted after 3 PM CT will be processed the next business day.**