State Aid
Bridge News
January 2018

In our 2017 State Aid Bridge Newsletter (PDF) on page 16, we eluded to providing our county/local program administrators (PA) training materials specific to their important roles as PA’s at the next Bridge Safety Inspection Refresher Training Seminar. As you can see below the Bridge Office has an all new Program Administrator “Breakout” Session scheduled for the 2018 Bridge Safety Inspection Refresher Training. If you’re a PA, we highly recommend attending the 2018 seminar to capture this new material. We anticipate in future seminars a continued training section for PA’s. Lastly, we appreciate those PA’s who responded to our survey to help us plan the 2018 PA breakout session topics.

Bridge Safety Inspection Refresher Training

Introduction

MnDOT, in cooperation with the FHWA and the University of Minnesota, College of Continuing Education, are pleased to offer seven Minnesota Bridge Safety Inspection Refresher Training seminars to be held at various statewide locations in February and March 2018. 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.

Who should attend

Individuals who need to maintain MnDOT certifications as Bridge Safety Inspection “Team Leader.” Attendance is required at a minimum of two bridge inspection refresher training seminars (continue on page 2)
...continued, Bridge Inspection General

during each four year recertification period.

- County, city, or consultant engineers who are designated as bridge inspection “program administrators” are required to attend a minimum of two bridge inspection seminars every four years.
- Individuals who assist in bridge inspections are not required to attend, but are welcome and encouraged to do so.

Description

MnDOT conducts Bridge Safety Inspection Refresher Training each year to improve the quality of inspections, introduce new equipment and techniques, and maintain consistency and reliability throughout the statewide network of bridge safety inspection programs. Speakers will discuss a variety of issues that surround key topics, and use visual presentations with handouts to deliver the core of this training.

2018 topics

- Bridge Inspection Field Manual update
- Fatigue prone details on steel bridges
- Slope protection issues (exposed footings or pilings)
- Bearing inspection (common problems)
- Bridge condition rating examples
- PA “breakout” session—inspection report review and response

Instructors

- MnDOT and FHWA staff

General Information

- The seminar fee is $125 and includes training materials, lunch and refreshment breaks.
- Registration begins at 7:30 a.m. Seminars are scheduled from 8 a.m. to 4 p.m.
- Class space is limited and early registration is highly recommended.

Registration questions contact: Marie Villano, University of Minnesota, 612-624-4972, ccapsconf2@umn.edu

Curriculum Questions Contact: Pete Wilson, MnDOT, 651-366-4574, pete.wilson@state.mn.us

Dates and Locations

You may register online (full list of date/times are located on the right side of webpage) or print out a registration form (PDF) and mail or fax in

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<thead>
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<th>Location</th>
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<td>Hennepin County Public Works Facility</td>
<td>1600 Prairie Dr.</td>
<td>Medina, MN</td>
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<tr>
<td>February 20, 2018</td>
<td>Canadian Honker Events at Apache</td>
<td>1517 16th St. SW</td>
<td>Rochester</td>
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<td>March 1, 2018</td>
<td>Holiday Inn</td>
<td>200 W First St.</td>
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<td>MnDOT Training and Conference Center</td>
<td>1900 County Road</td>
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<td>1501 State Street</td>
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<td>1111 Event Center Dr. NE</td>
<td>Bemidji, MN</td>
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Questions regarding this topic can be directed to Jennifer Wells at jennifer.wells@state.mn.us or 651-366-4573 or Peter Wilson at pete.wilson@state.mn or 651-366-4574.
Bridge Maintenance

SIMS
The SIMS Maintenance Module is available for local agencies to utilize. Demonstrations of the Maintenance Module are available to local agencies by contacting Sarah Sondag at sarah.sondag@state.mn.us.

Training
Bridge Maintenance Training is also available to local agency participants. Training announcements are posted on the SALT Trainings and Workshops webpage. If interested, please follow the registration process outlined in the training announcement.

A brief description of each class is presented below.

Bridge Maintenance Academy II (will NOT be offered in 2018)
In Bridge Maintenance Academy II, participants will receive an introduction to the fundamentals required to perform bridge maintenance effectively including strategies for structural steel, 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 cost to attend Bridge Maintenance Academy II will NOT be offered in 2018. It is anticipated that a class will be offered in 2019. The cost to attend Bridge Maintenance Academy II is $100.

Bridge Maintenance Academy III (will not be offered in 2018)
In Bridge Maintenance Academy III, 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, installing a strip seal joint and performing full depth deck patching. 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.

The cost to attend Bride Maintenance III is $100. Registration will be available in January on the SALT Trainings and Workshops webpage. If you would like more information about Bridge Maintenance Training, please contact Sarah Sondag at sarah.sondag@state.mn.us.

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

Bridge Preventive Maintenance eLearning Modules
Bridge preventive maintenance eLearning modules developed by MnDOT are available to agency participants. Modules include:

- Crack sealing
- Strip Seal Gland Repair
- Poured Joint Sealing

An eLearning module for Bridge Flushing is also under development and is anticipated to be completed later this year. The eLearning modules focus on planning, equipment, materials and best practices for these bridge preventive maintenance activities. These modules are available on the Bridges and Structures Training webpage. There is no cost to access the bridge preventive maintenance eLearning modules.

Bridge Maintenance Manual
Updates for the MnDOT Bridge Maintenance Manual were delayed due to staffing changes. It is anticipated that the manual will be posted in 2018.

Midwest Bridge Preservation Partnership
The Midwest Bridge Preservation Partnership (MWBPP) is comprised of representatives from regional state and local highway agencies, provincial transport agencies, industry, suppliers, consultants, and academia. The mission of the partnership is to provide a platform for the MWBPP Member Agencies and Organizations to exchange, promote, and advance best practices, new technologies, and innovation in the areas of highway bridge management, inspections, preservation and maintenance.

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Bridge Maintenance

The 2017 Midwest Bridge Preservation Partnership Meeting was held in Minneapolis. The partnership was able to offer registration scholarships for 10 local agency representatives. Thank you to all who participated to make it a successful meeting!

For those who were unable to attend, presentations on relevant bridge preservation topics, including bridge maintenance training, innovative contracting methods, bridge preservation plans, emergency response and bridge preservation research, are available from the TSP2 2017 MWBPP Meeting PowerPoint Index (PDF).

One of the goals of the MWBPP is to promote outreach to local agencies. The partnership has monthly teleconference calls, working groups and annual meetings in order to conduct partnership business and exchange bridge preservation knowledge. If you would like more information about the partnership, please contact Sarah Sondag at sarah.sondag@state.mn.us.

Bridge Hydraulic News

It’s been a busy year for us here in Hydraulics. We were able to complete our Plan of Corrective Action on scour critical bridges (Metric 18). Thank you for all of your help and cooperation on this effort. We are now in compliance.

A lot of research was done in 2017. We were able to publish our paper on “Multi-Beam Sonar Infrastructure Mapping” and will be presenting a poster on this subject at the World Environmental and Water Resources Congress that will be held here in Minneapolis this June. A link to the paper can be found on the Hydraulics Bridge Scour webpage.

We have contracted the St. Anthony Falls Hydraulic Laboratory to develop a fish passage guidance document. This will be a compilation of all the recent research we have done on fish passage in culverts as it pertains to us in Minnesota. It should be done by summer 2018.

Nicole Bartelt has been very active organizing a STEM outreach program for school aged children. If you know any teachers please share the STEM Education and Outreach website with them as this is a very exciting program that teaches children all about bridges.

Local Bridge Replacement Program Update

The 2017 legislative session ended with the passage of two important pieces of legislation that impacted funding and modified language in the Local Bridge Replacement Program (LRIP).

The 2017 Capital Improvement Appropriations Bill (Bonding Bill) appropriated $49,212,000 for the LRIP. The bond proceeds specified two projects for funding. The city of Minneapolis was appropriated $31,875,000 for the rehabilitation and restoration of the historic 10th Avenue bridge over the Mississippi River. This bridge is a 2,153 foot long concrete open spandrel arch structure that rises 109 feet above the Mississippi River in downtown Minneapolis. The city of Isle located on the south east side of Mille Lacs Lake was appropriated $800,000 for the demolition and replacement of the Malone Island Bridge. The remaining $16,537,000 of bond funds is available for bridge replacement projects throughout the state. To date, 62 bridges were approved for funding for replacement. A portion of the funds have also been set aside for the 20 percent local match of the 2018 Federal Bridge Off-System Bridges in the State Transportation Improvement Program.

The legislature also added new funding in the 2017 Transportation Appropriations Bill (Chapter 3-HF No. 3) by dedicating 13 percent of the motor vehicle lease sales tax revenue for the state transportation fund earmarking the funds specifically to be used for the local bridge program. The effective date is June 30, 2018 and the transfer of funds on July 15, 2018. The budget office estimates the available funding from this account will be approximately $12-$13 million for the local bridge program. Projects will be selected in July when the funding is appropriated into the state transportation fund and Minnesota Management & Budget releases the funds to MnDOT.

Revisions were made to the language in Statute 174.50 Minnesota State Transportation Fund by adding a subdivision to define major local bridges as bridges that cost $7,000,000 or more. How this changes the bridge program will depend on how the legislature composes the language in the bonding bill and session law if new funding is appropriated for the local bridge replacement program.

Subd. 6d. Major local bridges.

For an appropriation made specifically for purposes of this subdivision, the commissioner may make a grant under this section to any political subdivision for replacement or rehabilitation of a major local bridge in which the grant award is $7,000,000 or more. If in any year money appropriated for local (continue on page 5)
Local Bridge Replacement Program Update

Bridge replacement and rehabilitation projects under this subdivision remains available after all identified and eligible projects under this subdivision have been funded, the commissioner may use remaining funds to make grants under this section for less than $7,000,000.

At this time, we encourage you to visit the SALT Local Bridge Replacement Program webpage for the history, details and information on the Township program. There are also links to tools on various resolutions, such as how to advance county regular/county municipal funds to supplement the Town Bridge Account. Tools on how to create a prioritized bridge replacement list, and to amend a prioritized bridge replacement list is also provided.

For more Information you can contact Patti Loken, State Aid Programs Engineer at patti.loken@state.mn.us or 651-366-3803.

Local Historical Bridge Preservation Update

We’re wrapping up the Local Historic Bridge Phase III Study, with our final project team meeting scheduled for January 11, 2018. At this time we want to thank the entire project team which includes Patti Loken, Renee Barnes, Kristen Zschomler, Linda Pate and Alyssa Rubenstrunk of MnDOT, Joe Litman and Lisa Karlgaard of LHB, and Amy Squitieri and Bob Frame of Mead & Hunt. These individuals have all been very committed to improving the local historic bridge program for Minnesota. Another individual to thank is Steve Olson with ONE, who was instrumental in developing the individual bridge reports and the general bridge management plan for the Midtown Corridor in Minneapolis. Steve also played a big role in the Phase I Local Historic Bridge Study. To get additional information on the Local Historic Bridge Phase III Study, please see the 2016 State Aid Bridge Newsletter (PDF) on pages 6-7.

Through the Phase III study we have developed additional education sections which include:

- “Helping Preserve Minnesota’s Historic Bridges through Collaboration” video (YouTube)
- A Rehabilitation Projects webpage
- From the Phase III study efforts, and the Midtown Corridor study, we included additional historic bridges in the “Find a Historic Bridge” section on the Find a historic bridge webpage.

The historic bridges website has now become a huge resource for historic bridge owners, historians, bridge designers, contractors, state and federal agencies, and other stakeholders.

Looking back since 2010, the SALT Bridge Office has processed over 20 local historic bridges. Big credit goes to our excellent local bridge designers, historians, local bridge owners, bridge contractors, SALT Office, MnDOT CRU, FHWA, MnSHPO, etc. The historic bridge education process over the years has allowed us to collaborate much better between stakeholders, leading us to solutions guided by the historic bridge process, historic bridge study results, and other tools including alternate funding resources such as Minnesota Legacy Grants. We’re currently processing four local historic bridges for owners who received legacy grant funds. They include: Eden Township in Pipestone County, City of Cannon Falls in Goodhue County, Watonwan County, and City of Beaver Creek in Rock County.

2017 Featured Local Bridge Construction Projects

This year we wanted to highlight a few very noteworthy local bridge construction projects. Bridge 50587 over Dobbins Creek in Mower County and Bridge 27B97 over BNSF Rail Yard in the City of Minneapolis were both nominated for a 2017 MnDOT-AGC Bridge Construction Award. Bridge 50587 was nominated in the category for bridges costing between $1.5 million and $5 million, and Bridge 27B97 was nominated in the category for bridges costing greater than $5 million.

Bridge 50587 was designed by Erickson Engineering, and constructed by ICON Construction, LLC. The bridge deck utilized high performance (continue on page 6)
...continued, 2017 Featured Local Bridge Construction Projects

cement in lieu of a low slump overlay. Although this is becoming more common with bridges on the local system being designed under the 2016 MnDOT specifications, this bridge was designed under the 2014 specifications and was one of the first local bridges to use the high performance cement option for the deck. The new bridge included complex tall vertical abutments to better align with the retaining walls projecting from the dam. Limestone bedrock was at a shallow depth so pile driving included the use of rock sockets to anchor the piling into bedrock. The contractor was extremely careful during pile driving operations to prevent damage to the upstream dam structure.

Several aesthetic measures were included on the bridge and retaining walls, including form liner, reverse batten surface treatment, ornamental railing, and lighting. The workmanship and appearance is very pleasing. The concrete special surface finish and paint finish on the ornamental railing is very uniform. The reverse batten surface treatment has very clean lines and the form liner used on the retaining walls looked very good. The ride quality of the roadway surface on the bridge deck is smooth. The contractor and Mower County worked as partners on the project to insure a quality product and to meet the time schedule.

Bridge 27B97 was designed by design team PARSONS, ONE and SEH, and constructed by Lunda Construction Company. The design solution consisted of a 27-degree skew 305-foot weathering steel load path redundant Warren truss structure with a post-tensioned concrete lower chord, and two 126'-9" conventional steel girder approach spans. The substructures consist of solid wall piers supported on spread footings and steel H-pile supported abutments. Due to the complexities of the site which included crossing over one of Burlington Northern Sante Fe Railroad's (BNSF) most heavily-used railyards in the midwest, removal and erection operations used an innovative launching system.

The launching system was sized for the roughly 800-ton new truss span, but was first utilized to remove the two existing most western steel trusses including their concrete deck system over the BNSF’s main line tracks. The launching assembly consisted of twin plate girders bolted together with cross bracing near each truss plain. The contractor selected Hilman rollers as the moving vehicle that traveled in channel sections acting as tracks and welded to the top of the launching beams. The new truss was fabricated by Industrial Steel Construction, Inc. in Gary, Indiana, and was launched using two four hour windows. In June of 2017 the truss was lowered onto the permanent bearings. Once in place on its bearings, the contractor poured the concrete and post-tensioned the lower chords, then poured the deck, sidewalks, and railings. The abutment and pier construction, and aesthetic treatment workmanship was very good. The contractor used a full depth, contractor designed mix that was developed by Dr. Kevin MacDonald and the deck is performing well.

The BNSF railroad was a strong, willing partner in this project and worked very hard and diligent at providing the contractor relief with as many and as long of construction windows as possible. The contractor did a very good job in constructing and utilizing the intricate bridge launching system. The contractor and their subs did a great job adhering to safety policies. Because of the construction in the rail yard, extra training and certifications were needed for all employees.

(Bridge No. 50587, Oakland Place S.E. over Dobbins Creek, Mower County, and nominated for a 2017 MnDOT-AGC Bridge Construction Award.)

(Bridge No. 27B97, St. Anthony Parkway Bridge over BNSF rail yard (Bridge No. 27B97), City of Minneapolis, and 2017 MnDOT-AGC Bridge Construction Awards Recipient.)
LRRB Bridge Research Projects

Since Kevin Western, our State Bridge Engineer joined the Local Road Research Board (LRRB), we were confident that he would be influential in bringing us some valuable local bridge research projects. His collaboration with MnDOT Bridge Standards and Research, SALT Bridge, and the Bridge Office resulted in the following three bridge research projects. They involve debonded prestressed strand in prestressed beams, bridge deck performance, and anchorage of epoxy-coated rebar using chemical adhesives. The following is a brief summary of each of the three research projects.

Debonded prestressed strands in prestressed beams

The objective of this study is to review the literature with regard to the causes of end cracking in prestress bridge girders with draped strands, and studies associated with the use of debonded straight strands and its potential impact on shear strength. Fabricators will be queried with regard to their strand cutting patterns and crack observations. In addition, current AASHTO design specifications associated with the use of debonded strands will be reviewed and compared with those of MnDOT and with states currently using debonded strands. States such as Michigan with similar climate and exposure conditions similar to Minnesota will be surveyed to determine the performance of the in-service girders with debonded strands. The potential impact of the project is to produce prestressed bridge girders with increased durability and aesthetics, without compromising shear strength. Use of debonded strands could potentially lead to reduced fabrication costs. The principal investigator will be Catherine French, distinguished professor with the University of Minnesota. The scheduled date for final project completion is summer of 2019.

Bridge deck performance

Concerns about long term corrosion of bridge deck reinforcement and degradation of the surrounding concrete have led to innovative approaches to protect steel rebar and reduce concrete cracking in Minnesota. First, a population of approximately 661 bridge decks were built between 1975 and 1989 with an epoxy-coated rebar top mat and uncoated black bar bottom mat to protect the top layer of steel reinforcement from corrosion. Most of these structures are still in service and have not been re-decked. Second, approximately 20 bridge decks have been constructed in the last five years with polypropylene fibers in the concrete mix to reduce the width and amount of deck cracking.

To determine if the use of epoxy-coated top mat rebar or polypropylene fibers has affected the rate of deck deterioration, the objectives of this project include determining how fiber reinforced bridge decks are performing compared to control group twin structures constructed without fibers, and determining how the epoxy-coated top mat bridge decks are performing compared to control group twin structures constructed without mixed rebar decks, and establishing whether preventative maintenance plan should be developed for these bridges. The principal investigator will be Ben Dymond, PhD and Assistant Professor with the University of Minnesota Duluth. The scheduled date for final project completion is fall of 2018.

Anchorage of epoxy-coated rebar using chemical adhesives

Post-installed reinforcement is used to connect a new concrete member to an existing concrete structure. Use of traditional black steel in post-installed applications may lead to corrosion. To this end, MnDOT and local bridge owners have used and continue to use epoxy-coated rebar in anchorage applications with chemical adhesives (e.g., post-installed traffic barrier or pier crash strut). However, chemical adhesive suppliers (e.g., Red Head, Hilti, Powers or ATC) have indicated that design tables specifying tensile pullout strength of rebar installed with a chemical adhesive were all developed using traditional black rebar. The objective of this project is to determine the effect of the rebar epoxy coating on the tensile pullout strength when compared to traditional black rebar, where both types of bars are post-installed with the same chemical adhesives, and determine whether the tensile pullout strength of epoxy-coated rebar is greater or less than the tensile pullout strength of traditional black rebar.

A more detailed knowledge base surrounding the tensile pullout strength of epoxy-coated rebar is warranted to ensure the safety of structures constructed with epoxy-coated rebar that were post-installed with chemical adhesives (e.g., post-installed traffic barrier or pier crash strut). If the tensile pullout strength of epoxy-coated rebar post-installed with chemical adhesives is greater than or equal to the strength of traditional black bars, the use of epoxy-coated rebar is warranted to reduce life cycle costs associated with maintenance. The principal investigator will be Ben Dymond, PhD and Assistant Professor with the University of Minnesota Duluth. The scheduled date for final project completion is summer 2018.
New Minnesota Truck Weight & Overweight Permit Vehicle Classification (A, B, C) Calculators

In cooperation with the County Engineers Oversize and Overweight Committee, SALT Office and Minnesota’s Statewide Truck-Weight Compliance Education Training Program, we’re developing a Truck-Weight Calculator Tool/Application for our roadway authorities, truck manufacturers, haulers, and enforcement agencies. Along with the Truck Weight Calculator Tool we will also be implementing a calculator tool that determines if an overweight truck is a Minnesota Standard A, B or C annual permit truck, or a C+ “super load” single trip permit truck for bridge permitting. These two new tools may interact together or be separate resources as they’re performing different evaluations. Our goal is to allow the user to enter the specified axle weight and spacing once for both independent tools to operate.

Over the past several months we have been working with Bradley Wentz the Program Director of Advanced Traffic Analysis Center at the Upper Great Plains Transportation Institute at NDSU (and former Becker County Engineer), and Greg Hayes the Coordinator-Instructor for Minnesota Truck Weight Compliance Training at Alexandria Technical and Community College. We’re currently developing a contract between MnDOT and NDSU through an in place master contract agreement. The Champions of this contract work will be Greg Hayes, the SALT Bridge Office, with support from Rich Sanders (Polk County Engineer), and MnDOT Office of Freight & Commercial Vehicle Operations.

As you know the MCEA and its customers have been pursuing a Unified Permitting Process (UPP) for Minnesota local roads and bridges. You can reference the 2017 SA Bridge Newsletter (PDF) on pages 12 for a brief summary on UPP and the Oversize/Overweight Vehicle UPP Phase I, August 2017 report (PDF) for the UPP Phase I final report for greater project details. As you can imagine the UPP will need the necessary tools and software to evaluate the on demand permit requests. The truck weight calculator and more specifically, the ABC calculator tool for bridges, are important pieces that will eventually feed into the unified overweight permitting workflow.

The primary purpose of the truck weight calculator tool is to help our haulers, agricultural producers, and others determine the maximum legal weight that any set of axles on a vehicle/vehicle combination may carry on Minnesota state and local highways. The calculator will be an adaptation of the successful truck weight calculator that North Dakota currently uses. The North Dakota calculator will be amended to include applicable Minnesota truck weight laws. Greg Hayes will be called upon to make sure our state laws are being properly applied in the calculator, and tested against his training handouts, resources, and worked out examples. Along with Greg’s involvement, we will have others who have deep knowledge of our truck weight laws and have routinely performed truck weight calculations by hand provide testing. To see how the NDSU truck weight calculator works, please visit the free online application. We hope to get NDSU under contract soon, and will be providing occasional updates as the product becomes closer to implementation. We envision Brad and Greg helping us with the marketing of the tool and providing some live demonstrations statewide. Greg will eventually be using this tool in his truck weight education classes.

As for the permit truck bridge calculator, based on the axle weight and axle spacing’s input, it will tell you if the truck is an A, B, C or C+ permit truck. If the truck is A, B or C the owner can pull the bridge inventory sheet and in the lower right-hand corner see the A, B and C permit restriction codes. Along with the load rating form, the owner can pull up the restriction and advise the hauler accordingly. If the truck is a C+, the owner will need this truck analyzed by their bridge consultant with assistance from the SALT Bridge Office. Through years of evaluating legal Special Hauling Vehicles (SHV) we have populated and continue to populate the ABC restriction codes, and related load rating information for local bridges. As our statewide SHV evaluations proceed, a bridge permit data base is being developed which will feed the UPP, and assist local bridge owners with these overweight permit evaluations more quickly. To understand more about the ABC and C+ bridge permitting, please contact Moises Dimaculangan or Dave Conkel.
2017 Bridge Design Workshop

In May of 2017 the MnDOT Bridge Office hosted a full day Bridge Design Workshop for bridge consultants, and bridge engineers/owners. The workshop discussed the MnDOT LRFD Bridge Design Manual changes, and provided a bridge standards, foundation and construction update. Also, a topic on bridge barriers, parapets and railings, bridge scoping, pier protection and adhesive anchors was presented. The workshop concluded with a bridge program update. It was great to see our local bridge consultants and local bridge engineers attend this workshop. The last such bridge design workshop was conducted back in 2012. Between workshops, good communication between consultants, local bridge owners, SALT, SALT Bridge, SALT District Offices, FHWA and the Bridge Office carries on.

SALT Bridge communicates the rapidly changing bridge design specifications, bridge standard details, bridge construction specifications, and MnDOT Bridge Office policies/updates to external customers by broadcasting timely electronic mail statewide. Working our communication efforts through the MCEA Bridge Committee has also been very important to make sure local bridge owner representation and engagement is incorporated.

New P-1 Concrete Parapet for Local Bridges

In last year’s State Aid Bridge Newsletter we discussed the implementation of the new Manual for Assessing Safety Hardware (MASH) Test Level (TL) - 4 Concrete S Barrier. You can reference the 2017 SA Bridge Newsletter (PDF) on page 15 for more specifics. As noted, the S barrier is a TL- 4 which essentially means it’s good for higher speed roadways with a mixture of trucks and heavy vehicles.

After tackling the much needed TL-4 S barrier the Bridge Office worked to develop a MASH TL-2 concrete parapet suitable with or without a raised sidewalk. After coordination with crash test experts from the Texas Transportation Institute, Bridge Office R & D Committee, etc. the Bridge Office created the new P-1 concrete parapet standard details. The P-1 concrete parapet is a TL-2 which means it is adequate for low speed roadways with favorable site conditions, and a small number of heavy vehicles. Please reference figure 7166e(A) (PDF) to see the P-1 concrete parapet standard for integral or semi integral abutments.

For local bridges we have started implementing the P-1 concrete parapet for TL-2 site conditions. There will be more relevant guidance in the LRFD Bridge Design Manual, and additional standard details on the P-1 concrete parapet with metal railings shortly. Over the past several years bridge parapets, barriers, and metal railing selection criteria has become much more complex. As the Bridge Office continues to provide related details and policies to meet FHWA and AASHTO requirements, we will continue to help advise and collaborate with our local bridge consultants during the preliminary bridge plan development and approval process.

Local BRIM Update

We would like to give the local bridge community an update on the highly touted Bridge Replacement and Improved Management (BRIM) tool for local bridges. To refresh your memory on what is BRIM, please reference the 2017 State Aid Newsletter (PDF). At this time we’re happy to report that the BRIM tool programming and logic review is nearly complete.

We held a one day workshop in May with approximately 20 engineers representing county and city bridge owners, local bridge consultants,

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...continued, Local BRIM Update

MnDOT Bridge Office staff and SALT Bridge. The workshop introduced the project overview, goals, work plan, and establishment of applicable scaling tables, and importance factors. The information gathered from this workshop paved the way for programming to start to establish a Bridge Planning Index (BPI) for local bridges.

To continue the marketing and communication aspect of this effort, SALT Bridge presented at the 2017 MCEA Summer Conference with a short BRIM recap and update. As programming and feedback from the BRIM Committee continued, the BRIM tool was launched for beta testing in October. Since the beta testing period we have received good feedback comments to tweak the scaling tables and the program logic. As additional feedback surfaces from internal resources in the Bridge Office, and our local bridge consultants, we will continue to tweak the program.

In January we will be providing another version of the BRIM tool for testing by county engineers, city engineers, and consultants on the BRIM Committee and/or past workshop attendees. We anticipate another BRIM committee meeting in early spring to flush out details to make it available on the MnDOT Bridge Office Website. We will be discussing formatting, graphing, printing, and other program features with the committee. Other items that will be tackled include program instructions, documentation, a possible short presentation/training video, and district visits for demonstration/questions.

We plan to present the BRIM tool at the MCEA summer conference in 2018. At this time a special thanks to Barritt Lovelace with Collins Engineering, David Hedeen with MnDOT’s Bridge Information Management Unit, and other BRIM Committee Members such as: Brian Pogodzinski, Matt Hemmila, Jake Bronder and SALT Bridge. Along with going live with the local BRIM tool, we also look forward to evolving the tool in the future to assist local bridge owners with scoping bridge improvements (replacement or rehabilitation) and bridge preservation (crack sealing, joint repair, flushing, wearing course, joint replacement, painting, railing replacement, etc.) and their associated costs.

FHWA Sponsored T2 Scan

Our Minnesota FHWA will be sponsoring, through their Technology Transfer (T2) Program, up to four county engineers to visit a Geosynthetic-Reinforced Soil (GRS) Abutment Bridge over water in Buchanan County Iowa this summer. See the project evaluation report (PDF) for full details. This unique bridge is faced with a sheet pile wall for greater scour protection. The bridge has already seen a flood event and the GRS abutment system performed very well. To date we have constructed one GRS abutment bridge in Minnesota in Rock County over a short line railroad. Please reference the 2014 State Aid Bridge Newsletter (PDF) on page 7 for more details. Also we currently have 11 GRS abutment bridges ready for construction for the City of Minnetonka. These GRS abutment bridges will be faced with wet cast concrete blocks, and they all will span over existing pedestrian and bicycle trails. As you can see we have yet to build a GRS abutment bridge in Minnesota over water. This scanning opportunity should stimulate more interest to build a GRS abutment bridge over water in Minnesota. We know Defiance County in Ohio has built several GRS abutment bridges over water and all without a more protective sheet pile facing. See the Defiance County website for further information.

So far David Overbo, Clay County Engineer, has expressed interest to participate in this scanning tour and to demonstrate a GRS abutment bridge over water. At this time we will be looking for additional county engineers to participate in this scan. If interested, please let either Dave Conkel SALT Br Engineer or Brian Pogodzinski-MCEA Bridge Committee Chair know as soon as possible. Don’t forget GRS technology can save 40-60 percent in abutment construction, and we now have experience with GRS in Minnesota to provide you ample guidance and information for (continue on page 11)
...continued, FHWA Sponsored T2 Scan

Lastly, the FHWA is also sponsoring, through their T2 program a scan of drone use for local bridge inspection best practices. This scan will likely be championed by Joe Campbell of the Mn-FHWA who has recently presented and demonstrated on drone use at several State Aid District meetings. Again, if you have deep interest in this subject matter please tell Dave C or Brian P. This scan will happen in the summer or fall of 2018. You can reference MnDOT’s Aeronautics and Aviation [Unmanned Aircraft Systems (UAS) or Drones webpage](https://www.dot.state.mn.us/aeronautics/droneinspections.html).

Bridge Asset Management Update and NBIS Compliance Headlines

Critical Finding Process Revision

A Critical Finding is any structural condition that, if not promptly corrected, could result in collapse (or partial failure) of a bridge or culvert. The Critical Finding documentation requirements were streamlined in 2017. The requirement to file two reports (one to report the Critical Finding and one to document how the safety concern was addressed) has been removed. The timeframe in which the reporting was also aligned to the 90 or 180 day requirement as imposed by the NBIS.

The purpose of the Critical Deficiency Report is to document the event and the resolution, so that future inspections can monitor with additional consideration. The report should be filled out at any time that any of the following criteria is met:

- NBI 58 (Deck Condition) is rated 2 or less.
- NBI 59 (Superstructure Condition) is rated 2 or less.
- NBI 60 (Substructure Condition) is rated 2 or less.
- NBI 61 (Channel Condition) is rated 2 or less.
- NBI 62 (Culvert Condition) is rated 2 or less.
- ADE 800 (Critical Status) is rated in condition state 4

MnDOT will annually present a summary of recent Critical Findings and resolutions at the bridge inspection refresher seminars so the state as whole can learn from the experience of others.

If you have questions to how the new process works, additional information is documented in part A.6.2 of the [Minnesota Bridge and Structure Inspection Program Manual](https://www.dot.state.mn.us/bridge/structure inspection program manual.pdf). Additional questions can be directed to David Hedeen at david.hedeen@state.mn.us or 651-366-4528.

MnDOT Bridge Inventory Website

The MnDOT Bridge Inventory website was completely overhauled in early 2017. The new website contains contact information, online forms to update bridge inventory information and links for live reporting of bridge data.

All SIMS reports due by February 15, 2018

The Structure Information Management System (SIMS) will be closed at 11:59 PM on February 15, 2018 in order to aggregate the dataset for the annual National Bridge Inventory submittal.

- Be sure to run the [Inspections Due Report](https://www.dot.state.mn.us/bridge/sims/inspectionsdue.html) for your agency to ensure that inspections due for the season have been properly entered and approved.

- It also would be a good idea to run the [Bridge Rating and Posting Report](https://www.dot.state.mn.us/bridge/sims/bridgeratingandposting.html) to ensure that no bridges are missing required Load Rating forms or Load Posting signs.

If these items are not cleared out by 11:59 PM on February 15, 2018, the data will be sent as-is to the FHWA, and consequences will be addressed during the 2018 NBIS Compliance Reviews.
Bridge Plans with Colored Rebar & Special Curb and Gutter Transition Detail

At our all day County Engineers Bridge Committee Meeting back in early November 2017, we had an opportunity to hear about colorized rebar plans and a curb and gutter transition detail. These interesting concepts were developed and implemented by Tim Stahl, Jackson County Engineer and a current Bridge Committee Member. Over the years, State Aid Bridge has seen Tim's local bridge plans come through for processing with these interesting items. Because Tim has had some good success with these items, other local bridge owners may find the same benefits.

The idea behind the color coded rebar plans was to help his bridge inspectors, especially the less experienced inspectors, to quickly identify and verify the rebar placement in the field. Tim's analogy is it's similar to a wiring or process diagram with colored coded instructions to simplify where things need to be placed, and connected so the system operates correctly. The color coding eliminates any reservations on the proper location. We understand for a typical local bridge plan it may add an additional $1,000 or so to colorize the rebar details. For Tim's situation at Jackson County, it was well worth the money. For more information on color coded rebar plans, please contact Tim Stahl or State Aid Bridge.

The other interesting and effective item Jackson County has successfully implemented is the Special Curb and Gutter Transition Detail. This effective concrete curb and gutter transition section is placed off the bridge ends to direct deck drainage flow beyond the abutment wing wall fill slopes. This results in protecting the fill slopes behind the wing walls and adjacent areas off the bridge. Ideal bridge sites for this curb and gutter transition detail would include low volume and low speed roadways requiring no approach guard railing, and roadways with gentle profiles. Tim has been using this transition detail for a decade now. He was successful in capturing a grant to build several metal curb and gutter transition forms to share statewide through the Local Road Research Board's Local Operational Research Assistance Program. Again, please feel free to contact Tim for more information on the transition details and the availability of steel forms.

New Bridge Deck Overlay Policy

Back in November 2017, the MnDOT Bridge Office issued a new bridge deck protection policy memo which immediately made its way to our local bridge consultants for implementation. With the advent of High Performance Concrete (HPC) and its increased use on state and local bridge projects, we’re using more monolithic decks, and using less deck systems with a separate low slump wearing course.

The HPC bridge decks are resulting in fewer cracks, and now using HPC in combination with synthetic fibers in the mixes, deck cracking has reduced considerably, with some decks exhibiting no cracks when viewed a year or more after opening to traffic. Note, low slump concrete wearing courses are still an important tool in deck management, but monolithic decks with HPC and synthetic fibers are performing better in regards to crack control. MnDOT anticipates that the percentage of new state bridges receiving a low slump concrete wearing course will decrease from 55 percent to approximately 25 percent under the new deck protection policy. Because local bridge decks are generally cast monolithic
...continued, New Bridge Deck Overlay Policy

and without a low slump wearing course, these percentages will be much lower for local bridges.

Under the new deck policy for both state and local bridge decks and slab span structures, we will now call for monolithic decks and slabs using HPC and synthetic fibers. However, exceptions to this policy may be warranted if the local bridge owner and their bridge consultant deem necessary. Some common conditions that may warrant exceptions are project locations where HPC concrete is not available, constant grade <0.83 percent (variations in superstructure deflections and finishing tolerances can make positive drainage difficult), steel superstructure with degree of curvature > 10 degrees, bridge skews > 30 degrees on two spans or more, super elevation transition occurs on the bridge, traffic staging, etc.

The new bridge deck policy also discusses repair projects, noting low slump concrete wearing courses are still a viable strategy for repair of existing bridge decks, and that other materials such as Polyester Polymer Concrete, Ultra-Thin Bonded Wearing Course, and silica fume modified concrete wearing courses can be considered for repair projects.

Standard Bridge Plans

Ron Gregg, Fillmore County Engineer and County Engineers Bridge Committee Member, shared his bridge plans with us for their County Road 109 over Beaver Creek. The bridge was locally funded and used a combination of materials including timber, precast and cast in-place concrete, and steel piling. The bridge details contained standards developed by a firm out of Lincoln, Nebraska. The bridge design and construction apparently saved the county some good money, and bridge construction was very fast. If you’re interested please contact Ron Gregg for more details.

With Ron’s bridge, it appears more discussion and interest for standard local bridge plans is being generated. The Minnesota counties currently showing interest in standards, and/or using standards from other states, tend to border the Iowa State line. Ironically the Iowa DOT has County Bridge Standard Plans which include a single span and three span prestressed concrete beam bridge, concrete box beam bridge, continuous concrete slab bridge, and a rolled steel beam bridge. Currently MnDOT only has standard precast concrete culvert plans, and standard bridge figures and details, but nothing specific to a standard bridge plan.

Recognizing the interest in more standard local bridge plans, the County Engineers Bridge Committee will investigate their potential for Minnesota local bridge owners. Currently if a local bridge owner similar to Fillmore County desires to pull bridge standards from another state they’re more than allowed to do so as long as they feel they’re meeting Minnesota Statutes. If the local bridge owner is using state and/or federal funds, they should be following MnDOT’s latest LRFD Bridge Design Manual, Bridge Standard Details and related policies. If an owner desires to use a standard bridge plan from another state and is using state and/or federal funds, they should consult with State Aid Bridge early in the plan development process.

Our typical bridge process relies on local bridge consultants statewide, hired by the local bridge owner to design and develop bridge plans and specifications specific to their bridge site. Through decades of designing bridges for local bridge owners, our consultants have become extremely efficient and cost effective in providing plans and specifications for a low cost bridge. If and when we start to explore standard local bridge plans, we will inevitably look to our consultants for their input and cooperation in this effort.

Note, MnDOT, in the past did have standard local bridge plans. They eventually became obsolete due to changing state and federal design and construction specifications, and demands from the bridge owner to modify the standards to best fit the bridge site for skew, roadway profile, hydraulics, and foundation requirements. Apparently the bridge standards brought on more work for the owners to modify them versus providing a more non-standard or customized bridge plan to begin with. Maybe we can find a nice balance between having some Minnesota standard local bridge plans specific for standard bridge sites, and the more tailored bridge plans which we traditionally see. This effort may require the help of the Local Road Research Board and pulling from any past studies and experiences.
Local Rating and Permitting Updates

Specialized Hauling Vehicles Load Rating Contract Update

Specialized Hauling Vehicles (SHV) Contract V has been completed. It was the biggest SHV load rating contract we've had in terms of the number of local bridges that were evaluated. With a budget of nearly $2 million, approximately 1,400 local bridges were load rated. Thus this gives us a total of over 4,300 local bridges that have been evaluated so far. Due to the vulnerability of local bridges to the SHV vehicles, approximately 1,300 of the 4,300 bridges required load posting. The next contract (SHV load rating contract VI), will have approximately 700 local bridges that would need to be evaluated. It's a two year contract that will include a combination of simple and complex structures. Due to the volume and the types of bridges that will be evaluated, it will be the largest SHV contract so far with a budget of $2.5 million.

As required by the FHWA, all bridges with the shortest span length greater than or equal to 200 feet will need to be evaluated for SHV by December 31, 2022. In our local bridge inventory, we have about 30+ complex structures that meet this criteria. We estimated that it will take two SHV contracts to evaluate these bridges. So we're looking at completing and fulfilling this FHWA deadline by 2021.

SHV contract VI will have 25 complex structures of different bridge types that will be evaluated. It includes post tensioned box girder bridges, truss bridges, masonry arch, continuous steel rigid frame, and the biggest one is the Hennepin Avenue Suspension Bridge in Minneapolis. Due to the complexity of the Hennepin Avenue Suspension Bridge, the cost to inspect and load rate the bridge was significantly more in comparison to the other complex bridges in the contract. A cost share agreement between MnDOT and Hennepin County was established and Hennepin County graciously agreed to a 50/50 cost share split.

There are approximately 10,000 culverts (concrete or metal) on the local bridge inventory. Not all will need to be evaluated for SHV. Prioritizing and eliminating culverts for evaluation based on their good physical condition is crucial as this allows us to focus on the culverts that are at higher risk of load posting, closure, or partial collapse. Past bridge safety inspections have shown that most of the metal culverts in Minnesota, especially the ones with span lengths greater than 10 feet, are starting to deteriorate and show some form of structural deformation, therefore it is very important that they get properly inspected and load rated. The SHV Contract VI will also include approximately 300 concrete or metal culvert structures.

Load Rating for the FAST Act’s Emergency Vehicles

The local bridge load rating form was also updated to include emergency vehicles. In the 2017 SA newsletter, we stated that in the next SHV contract, we will start evaluating our bridges for emergency vehicles (EV). This is in response to the memo that we received from the FHWA regarding emergency vehicles (fire trucks) as part of the federal law Fixing America’s Surface Transportation Act (FAST ACT). The law requires us to load rate and post our bridges for emergency vehicles. At this point, EV load rating information listed on the load rating form will be for information only until we get more direction from the FHWA, local bridge owners, and MnDOT. In regards to all local bridges that have been load rated in previous SHV contracts, we determined that there are approximately 4,000 bridges that have been entered and modeled in the AASHTO BrR load rating software (formerly known as Virtis). To date, we have analyzed this data and determined that about 2,200 local bridges are susceptible to Emergency vehicles based on the requirements that were established by the FHWA. SALT Bridge will further analyze these bridges in AASHTO BrR and determine which ones will require load posting considerations for emergency vehicles.

Bridge Load Posting

Over the years, trucks have grown in size and weight from simple single unit vehicles to heavy trucks, tractor trailers and special permit vehicles. (continue on page 15)
For this reason, live loads used in bridge design have also increased in various stages of the AASHTO Bridge Design specifications to reflect the increase in truck load characteristics. Many bridges that were designed and built for the lighter traffic loads still exist in Minnesota. They are either able to carry the current loadings in full or provide restrictions by way of load posting. Load posting is often required for bridges when the structure does not have enough capacity to safely carry the State Legal Loads. Their purpose is to prevent heavy loads from crossing the bridge that cause stresses above the safe limit.

The Minnesota Manual of Uniform Traffic Control Devices (MnMUTCD) regulates the signs that can be used by the state. The MUTCD is very restrictive as to what information can be shown on those signs, such as symbols, figures and text. R12-5 as shown in Figure 1 is the most common bridge load posting sign in Minnesota. Figure 1 uses typical truck configurations that is easily recognizable to represent every vehicle configuration. The weight that corresponds to each figure is the maximum Gross Vehicle Weight (GVW) of the truck that can cross the bridge. The symbols shown in Figure 1 are the only vehicle silhouettes allowed by MnMUTCD on a posting sign. It is important to note that the number of axles shown on each figure is a representative example only and that the actual axle configuration may be different.

To further interpret what the three silhouettes represent on the R12-5 posting sign, below is an explanation and examples for each of the figures.

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**Figure 1**

1. **TRUCK (TYPE M2)**
   - The first silhouette is a single unit vehicle. The single unit vehicle has a power unit and trailer that form one vehicle. The power unit and trailer are not designed to be detachable. The following are examples of vehicles governed by the single unit silhouette. *Specialized Hauling Vehicles (SHV) would fall under this category.*

2. **TRUCK + TRAILER (TYPE M3S2-40)**
   - The second silhouette is a two-unit vehicle. The vehicle consists of a power unit and a trailer. The power unit or single unit truck for this vehicle is detachable from the trailer. The following are examples of vehicles governed by the two-unit silhouette.

3. **TRUCK + DOUBLE TRAILERS (TYPE M3S3-40)**
   - The third silhouette is a three-unit vehicle. It consists of a power unit and two trailers that are detachable from one another. The following are examples of vehicles governed by the three-unit silhouette.
Another posting sign that is used in Minnesota is the R12-5a as shown in Figure 2. This sign is used when only the single unit vehicle controls the load rating and it requires load posting. The sign only applies to any single unit vehicle that has its trailer permanently attached to the tractor (power unit) on one frame, regardless of the number of tires, axles or axle configuration. SHV would fall under the TRUCK (TYPE M3) examples of vehicles above governed by the single unit silhouette.

In addition, bridge weight limits may be signed differently as shown in Figure 3. R12-1A posting sign is frequently used in situations where severe load restrictions apply. The gross vehicle weight for any vehicle including cars, trucks, vans, farm equipment is limited regardless of the number of axles that the vehicle has. The gross weight of the entire vehicle must be equal to or less than the limit on the sign.

Bridge Costs Update

Calendar year 2017 saw a very small unit cost increase for PCB type structures and a moderate unit cost decrease for the C-SLAB type structures. These two structure types account for the majority of local bridges. As usual, the C-SLAB structure type was the lowest unit cost structure on the local system.

We let a single steel pedestrian TRUSS structure in CY 2017 and that unit cost was moderately down 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 also added a new structure type to the report a couple years ago, 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, so we decided to start tracking them. We let one Pedestrian Boardwalk bridge in CY 2017 and the average cost was $90/sf. This price was up 19 percent from CY 2016.

There was a moderate decrease in the number of C-SLAB bridges compared to CY 2016 (12 let in CY 2017 vs. 17 let in CY 2016). There was a moderate increase in the number of PCB bridges compared to CY 2016 (29 let in CY 2017 vs. 23 let in CY 2016). The unit cost percentage increases/decreases are shown below.

- **PCB structure cost was up 1 percent** ($135.07/sf in CY 2016 vs. $136.03/sf in CY 2017)
- **C-SLAB structure cost was down 13 percent** ($136.38/sf in CY 2016 vs. $118.63/sf in CY 2017)
- **TRUSS pedestrian structure cost was down 18 percent** ($263.65/sf in CY 2016 vs. $216.26/sf in CY 2017)

We replaced approximately 48 timber bridges and seven fracture critical bridges in CY 2017. Timber bridges are considered to be of full timber construction or timber pile/abutment construction. The fracture critical bridges were high trusses, low trusses, and a thru-girder bridge.

Of the 48 timber bridges replaced in CY 2017, 26 of them were replaced with concrete box culverts, five were replaced with C-SLAB bridges, and 15 were replaced with PCB bridges. The remaining two timber bridges were removed from the system, via ROAD IN LIEU projects.

Of the 7 fracture critical bridges replaced in CY 2017, four of them were replaced with PCB bridges and three were replaced with C-Slab bridges.
...continued, Bridge Costs Update

![Bridge Construction Cost History](image)

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Contacts:

Conkel, Dave
dave.conkel@state.mn.us
State Aid Bridge Engineer
651-366-4493

Homan, Brian
brian.homan@state.mn.us
State Aid Bridge Plans Engineer
651-366-4494

Dimaculangan, Moises
moises.dimaculangan@state.mn.us
State Aid Bridge Load Rating & Permitting Engr.
651-366-4522

Brown, Steve
steve.brown@state.mn.us
State Aid Bridge Sr. Bridge Plans Specialist
651-366-4495

DeWall, Petra
petra.dewall@state.mn.us
State Aid Bridge Hydraulics Engineer
651-366-4473