

## LOCAL BRIDGE STRENGTHENING PROGRAM

Five bridge strengthening projects have been completed in 2018 to remove load postings, seven are nearly ready for construction (likely in Spring 2019), and two more have had load postings removed through advanced analysis methods. Additionally, BOS has contacted counties with proposals to strengthen or re-evaluate nearly thirty more identified as potential candidates.

The strengthening program is currently focused on superstructure retrofits on bridges in fair or better condition with significant life span remaining but underdesigned for today's truck loads. For more information or to request consideration of a bridge, contact Alex Pence at ([alex.pence@dot.wi.gov](mailto:alex.pence@dot.wi.gov)).



# WISCONSIN DOT STRUCTURES INSPECTION PROGRAM

## TECHNICAL BULLETIN

Issue 2 – December 2018

### STRUCTURAL REVIEW

Primary structural elements with a condition state of Severe (CS4) are required to have a review to determine if the condition “warrants a structural review to determine the effect on the strength of the element or bridge”. A structural review, as defined by WisDOT, is “a review by a licensed Wisconsin Professional Engineer to evaluate the observed field conditions and determine the impacts of the conditions on the performance of the element and the structure. Structural reviews may include a review of the field inspection notes and photographs, review of as-built plans or analysis as deemed appropriate to evaluate the performance of the element”.

A structural review shall be completed by the owner agency (or delegated Program Manager) as soon as possible, but no later than 30-days after the inspection. Results of the review can vary significantly, from the condition not having any effect on the capacity of the structure to the most extreme side being immediate bridge closure or reduced load postings.



Regardless of the outcome of the review, the results need to be documented in the Highway Structures Information System (HSI). Specific details on the documentation procedures will be presented in the

2019 refresher training. Until that time, the owner shall keep copies of correspondence and analysis on file for structures they have reviewed and forward that information to the Statewide Inspection Program Manager if requested.

## INSPECTOR TRAINING DATES

For training news as well as other pertinent inspection information, we encourage you to visit the [WisDOT Structure Inspection Website](#). The site contains the upcoming training schedule, previous training videos, HSIS training items, policy memos, inspection manuals, and other useful information.



### Upcoming Training Schedule

- WisDOT Structure Inspection Refresher Training (No Cost - **Mandatory**)
  - Online                      Spring 2019

## 2019 WisDOT Structure Inspection Refresher Training (SIRT)

All bridge inspectors and program managers in Wisconsin are required to have a WisDOT approved refresher training on a periodic (5-year maximum) basis. In 2019, the SIRT will be administered online using the WisDOT LearnCenter. More information on the LearnCenter can be found at this address:

<https://wisconsindot.gov/Pages/doing-bus/contractors/ctrctr-trng/default.aspx>

The training will consist of multiple modules that cover topics including inspection policy, best practices, equipment, procedures, documentation, etc.

It is anticipated that the class will be available no later than April 1, 2019. All inspections conducted after July 1, 2019 will require the inspector to have passed the 2019 SIRT. A reminder email will be sent to all active inspectors and program managers a few weeks before the class goes live.

## INSPECTION REMINDERS AND TIPS

### 2018 Field Manuals

New field manuals are available for active inspectors in Wisconsin. If you are an active inspector and have not received a new manual, please contact your WisDOT inspection PM (See contacts on last page of this newsletter) to schedule a time to stop by and pick up your manual(s).

It is anticipated that an addendum to the published field manual will be available in the spring of 2019.

### 2019 NBI File Submittal

The **HSI system will be in read-only mode from February 18<sup>th</sup> thru March 3<sup>rd</sup>** for development of the National Bridge Inventory (NBI) file. Please note the following:

- Inspections performed through the end of January 2019 shall be entered into the HSI system prior to February 18<sup>th</sup>.
- Inspections entered into the HSI system **cannot** be re-opened for editing or photo uploads after the NBI submittal.

## Common Element Coding Errors

During the 2018 quality assurance reviews, it was noted in many instances where the following errors had occurred:

- The element for steel columns (202) was used instead of the element for steel piling (225). A simple rule of thumb to follow, if the member was driven into place during construction, it is considered a pile; otherwise it is likely a column. Most bridges in the Wisconsin inventory have steel piling.
- Element 15 – Prestressed Concrete Top Flange was not used when the structure had prestressed box girders, T-beams, or other configurations where the top flanges are exposed to and directly carrying traffic or when the top flange is covered by a non-structural topping. The most common error found was traditional structures (slab or steel girder bridges) that have been widened with prestressed box girders. Those systems will have both a deck/slab element (for the old portion) and a top flange element (for the widened portion).

## Steel Piling Deterioration

In 2018, the Bureau of Structures conducted a statewide supplemental Quality Assurance (QA) inspection looking at bridges with exposed steel pile substructure units to ascertain the quality of inspection data for this element. This QA was triggered by a failure of a bridge in Wisconsin in May 2018 due to heavily deteriorated piling. It was noted in many cases that prior inspections did not have sufficient information regarding significant section loss at common locations of localized deterioration (waterline, pile to concrete cap interface, and ground line).

Often the cause of this insufficient inspection was due to inspectors not cleaning off surface rust to view the condition of the pile, and/or inspectors estimating section loss rather than taking specific measurements.

As stated in WisDOT Structures Inspection Manual Part 2 – Section A.1.1:

*The inspector should look for areas of laminate rust on the steel surface or areas of heavy blistering paint (caused by a build-up of rust under the paint surface). Common locations are horizontal surfaces, areas subject to salt spray from roads or areas near water surfaces. The most effective tools used to remove the laminate rust are chipping hammers and paint scrapers. Severe corrosion will usually consist of loose, brown laminate rust, and a hard, tightly adhered black corrosion product on the base metal surface. A chipping hammer is usually required to remove this black corrosion. Safety glasses should always be worn when using a chipping hammer.*

*Once the corrosion has been removed, the amount of remaining section should be measured and recorded. Methods to measure the remaining section include the use of a caliper, a micrometer or ruler with a straight edge spanning the depression to indicate the original steel surface. The surface area affected by the corrosion should also be measured.*

*Some corrosion is so severe that holes are created through the steel. This situation should be recorded as “through thickness section loss” rather than “100 percent section loss”*





since the latter term suggests that the entire member or element has corroded away.

It is important to note that corrosion of steel piling has been a cause of bridge failures in many States, including Wisconsin. It is imperative that inspectors measure and document significant corrosion findings, in all primary structural members including piles. If the cross-sectional area of a pile is reduced more than 15% it is recommended that the pile be considered in Condition State 4 (severe) and that a structural review be conducted to determine if the capacity of the bridge has been reduced.

For more information on review, analysis, or repair methods please contact the Bureau of Structures Inspection and Load Rating Engineers, or your local Program Manager.

Did you know:

Wisconsin has approximately 14,189 bridge structures that carry highway traffic. About 37% (5,305) are owned and maintained by WisDOT, and 63% (8895) are owned locally by counties, cities, towns, and private agencies. The average age of state owned bridges is 33 years while the average age of locally owned bridges is 39 years.

### Coding for Filled Arch Structures and Rigid Frames

The Wisconsin bridge inventory includes many filled arch structures. Often arch structures are coded incorrectly using both the culvert elements and the culvert NBI. One of the key differences between a filled arch and a culvert is the presence of a structural floor. Culverts have a structural floor; filled arches do not.

To code an arch properly, use the arch elements (141, 143, 144, 145) for the element portion of the inspection. If the arch sits on a concrete foundation that is exposed, code that using element 220 – RC Pile Cap/Footing.



In general, rigid frames are distinguished from arches by their design. Arches are designed for compression along the entire cross-section. Rigid Frames are designed for bending and have negative moment steel incorporated in the transition from the vertical walls to the horizontal slab. An example of an arch structure is on the left, and a rigid frame structure is on the right.

As with arch structures, rigid frame structures should also not be coded using culvert elements and NBI condition states. They should be coded using slab elements for the horizontal portion, and abutment elements for the vertical walls. If it is a multi-span rigid frame structure, then the element for pier walls should also be used for the interior vertical walls. NBI ratings of deck, superstructure, and substructure should be used as well.

For arch structures, the NBI ratings must include Superstructure and Substructure. The dividing line between Superstructure and Substructure is the spring line of the arch, which can be loosely defined for inspection purposes as the point at which the side walls become vertical. In some cases, there is no vertical surface and the arch rib sets directly on the footing. In these cases, the superstructure would be the arch and the substructure would be the footing.

The specific location of the spring line for inspection purposes isn't important; what is important is being consistent. To help with consistency, the inspector shall include in the inspection notes the location they are using to denote the spring line. For these types of arches, the deck NBI code is optional. It is only coded if the deck is an integral part of the structure (i.e. tied to the structure directly) and not simply a continuation of the roadway over the arch.

For any unusual or non-standard structures, the inspector can contact the Regional PM or the Bridge Management Engineer in the Bureau of Structures to discuss the proper coding. More information on specific configurations will be discussed in the 2019 Inspection Refresher Training.

### Load Posting Verifications

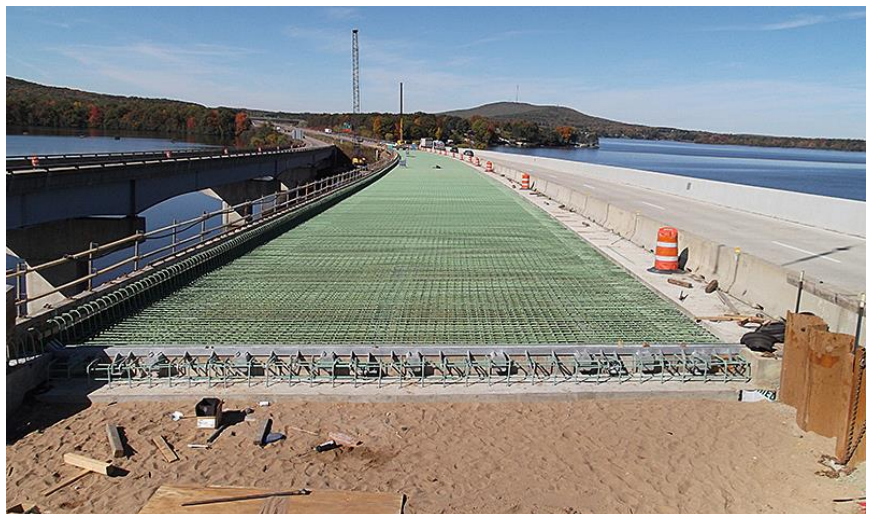
Inspectors often need to review load posting values in the HSI system with in-service signage while in the field. The load posting can be found in the HSI system under the Capacity tab and is also included on page 2 of the inspection report under the Capacity Section. Inspectors should review the capacity information with in-service signs and do the following:

- 1) If the Load Posting (Capacity Section) is blank and no signs are present in the field, Assessment 9034 should not be used in the inspection, and should be removed if it has carried forward from a previous inspection where signs were present.
- 2) If the Load Posting (Capacity Section) does not match posting signs present in the field, assessment 9034 shall remain in the inspection report, activity "Load Posted Verification" shall be added on the Create/Edit tab in HSI, and the Load Posting Verification Form (DT2122) shall be submitted with the inspection.
- 3) If the Load Posting (Capacity Section) has a weight limit value but no signs are present, assessment 9034 shall be used with the appropriate missing sign quantities in CS4.

### INSPECTION SCHEDULES - REQUESTING A CHANGE

There are occasionally special circumstances when the inspection schedule for a bridge needs to be adjusted. The most common reason is that there is construction work on the bridge that prohibits inspectors from conducting a full routine inspection. Another common occurrence is the desire for a program to move a single inspection to correspond with other inspections under the owner's jurisdiction.

Program Managers can request an extension to the scheduled inspection by submitting a request, via email, to the Statewide Inspection Program Manager (SIPM) at least



a month prior to the originally scheduled inspection for which the extension will be desired. The SIPM will determine if the extension is warranted and if so, will request permission from FHWA. After receiving confirmation from FHWA on the status of the request (approved/denied), the original requesting PM will be notified via email. PM's are advised that until permission is granted, they are to assume the schedule cannot be changed and plan to inspect the structure during the originally scheduled month.

If the request is denied, the inspection team shall perform the inspection during the original due month.

When entering an inspection with shifted schedule in HSIS, the software will automatically assume the inspection is late. To document that the inspection was not late, click on the late reason tab and select "FHWA Approved" as the late reason. In the notes, specify the inspection schedule was approved by BOS/FHWA in the notes, and then upload the written permission email (PDF format) from BOS on the Documents/Images tab under the Late Reason category.




## HSIS QUICK UPDATES

HSIS was updated in September of 2018. Some of the changes of note are described below.

- One of the additions was the "Fix" link; it was added for complete disabled reasons and on complete actions for inspections. These links will help direct the inspector to the tab or field that has missing data disabling completion of the inspection.

If your inspection has a completed disabled reason, you will not be able to complete the inspection until the issue triggering the reason is addressed. If your inspection has an on complete action, you can complete the inspection. The action listed will occur immediately when the inspection is completed. An example of an on complete action is changing the routine inspection frequency from 24 months to 12 months.

### Complete disabled

Reason	Fix
missing total time hours/minutes	
4 assessments with total quantity 0	
uw-profile selected but no underwater profile (pdf, doc, docx, xls, xlsx) UW Profile documents	

- Inspectors can now select which substructure elements were inspected as part of an inspection. There is a checkbox to select for indicating if a substructure unit was inspected or not. These checkboxes are located on the Underwater Tab.
- If an inspection does not have any photos or sketches uploaded on the Documents/Images tab but has defects with a quantity in CS3 or CS4, the inspection can currently be completed. An email notification will be sent to the inspection and statewide program manager alerting them of the missing documentation. In 2019, it is anticipated that HSIS will no longer allow inspectors to complete inspections missing this documentation.

For more information on these additions, please check the [WisDOT Structure Inspection Website](#), or contact Ryan Bowers or Travis McDaniel.

## ABOUT THE BULLETIN

The Bureau of Structures at WisDOT will publish 1~2 newsletters a year to discuss topics involving inspection, maintenance, repair, or improvement information and initiatives. If you have ideas for future topics, please submit to Rick Marz, Travis McDaniel, Matt Coupar or Steve Doocy.

## INSPECTION PROGRAM CONTACTS

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