Fracture Critical and Underwater Inspection of Local Bridges in 2013

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Wednesday, April 17, 2013
Bridge Conference
Kearney, NE

Items for Discussion

• Fracture Critical (FC) Inspection Issues
• Underwater Inspection Issues
• Summary of County Responsibilities
• Questions

Fracture Critical Inspection Issues

1. Definition of FC Bridges
2. Types of FC Structures
3. Nature of FC Inspection
4. Established Month of Inspection
5. Modifications to FC Bridges

Definition of a FC Bridge

• A bridge with Fracture Critical Member(s) (FCM)
• A FCM is a steel member in tension or with tension element, whose failure would probably cause a portion of or the entire bridge to collapse.
• Failure of steel members with the Load Path Redundancy of less than three would most probably cause a partial or total collapse.

Types of FC Bridges

• Steel Truss Bridges with only two trusses
• Two-girder Bridges
• Steel Substructure Caps supported at two points or less.
• Pin and Hanger Bridges with three girders or less.

Typical Fracture Critical Members (FCM)

• Tension Members of Two-truss bridges
• Tension Elements of 2-girder bridges
• Tension Elements of Floor Beams
• Gusset Plates and Splice Plates of FCMs
• Pin & Hangers and Pin Assemblies
• U-bolts connecting Floor Beams to Pins
• Steel Caps supported at two or less points
Nature of FC Inspection

- All exposed faces of fracture critical members shall be inspected at arm’s reach.
- During the inspection the FCM shall be free from dirt, debris, ice and snow.

Note: Consulting firms are responsible for a light cleanup of FCMs. The major cleanup effort is the responsibility of the bridge owner.

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Established Month of Inspection

- All FC inspections are moved to March, June, September and October in 2013.
- These inspection months remain constant for each FC bridge.
- The inspection interval could not exceed the 24-month maximum inspection interval. Therefore, inspections in January and February of 2014 and November and December of 2013 were moved to September and October of 2013.

Bridge Cleaning!!!

- Cannot be normally performed in the very cold months of November, December, January and February, and possibly March.

Established Month of Inspection (Cont.)

- To avoid inspection of too many bridges in September and October, inspections in some counties were moved to June.
- To avoid sending consultants to a county for only a few bridges, inspections in April and May of 2013 were moved to March of 2013.
- An attempt was made to keep all full-fracture critical inspections for a county in one year and all special inspections 12 months later in the same “Established Inspection Months”. After that, inspection intervals remain at 24-month intervals for both levels of inspection.
Established Month of Inspection (Cont.)

• To save funds without sacrificing public safety, all FC inspections at 12-month intervals were converted to 24-month intervals with a special inspection on the alternate years from FC inspection. Therefore, 2013 will have more full FC inspections than 2014.

• Most counties have FC inspections in one or two months but never less than three bridge inspections in a particular month. Therefore, more bridges were bundled in one month to avoid sending a consultant to a county for one or two bridges.

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Modification to FC Bridges

• Usually done to keep the bridge in service in lieu of in-kind-rehab or replacement.

• Field welds make the FC inspection tedious.

• Avoid field weld to tension members where possible.

• All modification and repairs of FCM requires a PE signature in the Critical Finding Report before opening bridge to traffic.

• Modification should be justified and done with load rating and inspection in mind.

Some Examples of Modification

Established Month of Inspection (Cont.)

• Seventy five percent of 2012 bridges were inspected in January and February. Therefore, September and October are busy months for FC inspection.

• The March and June workloads are light in comparison. Clean up can begin a month or two earlier.

• Of the 1200 FC local bridges, 950 of them will be inspected in 2013 by 8 consultants. The workload for 2014 will be light in comparison.

Some Examples of Modification
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Underwater Inspection Issues

1. Why underwater inspection (UWI)?
2. Types of Underwater Inspection
3. UWI Verification
4. List of bridges qualified for UWI (affects you)
5. What hinders UWI? (raises your cost)

Underwater Verification

• Currently, we have 86 UW bridges in the state plus 6 border bridges over Missouri River.
• After 2012 verification we now have:
  – 170 confirmed “Dive” bridges (95 of which belong to 45 counties and 54 of the 170 are over power canals)
  – 17 susceptible “Swim-by” bridges (10 of which are counties’)
  – 38 NPPD bridges were inspected by NDOR or private consultant while power canals were drained.
  – The remainder of bridges are either out of water or should be waded by routine inspectors.

Why Underwater Inspection (UWI)?

List of UWI Bridges

• A tentative list of UW bridges will be sent to all 45 counties involved next week.
• If you have any questions regarding the list, please contact me at
  – roe.enchayan@nebraska.gov
  – Office (402) 479-3682
  – Cell (402) 430-6199
• If you feel a bridge or two should be added to the list please let me know. We did not check every structure to verify for UWI.
What Influences Your UWI Cost?

• Debris at piers/bents or abutments causes scour. We need to inspect the scoured areas caused by this debris.
• Remove (not pass through) the debris to lower 2013 inspection cost–future cost as it may be removed from the list.
• Remove debris after spring runoff subsides.
• Inspections are scheduled for July through October. Plan debris removal accordingly.
• If you know Power Canals are drained for maintenance, inspect them and revise Pontis.

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County Responsibilities

• Know the established month of inspection and plan for clean up accordingly.
• When modifying a structure, do not complicate the structure further. Try to eliminate FCM by increasing load path redundancy.
• Check and remove debris at substructures after spring runoff subsides.
• Take advantage of Power Canal down times.

ANY QUESTIONS?