National Bridge Inspection Standards &
Bridge Maintenance Program Review
Highland County
October 7, 2019

By: Mark Stockman, PE, PS
CEAO Federal Bridge QA/QC Engineer

IN ATTENDANCE:

John Etienne
Gary Martin
Christian Dunlap
Mark Stockman, CEAO Federal Bridge QA/QC Engineer

SCOPE OF REVIEW:

The review consisted of interviews with Highland County personnel, reviews of inspection and inventory data, and reviews of Highland County bridge records. The office evaluation assessed Highland County's organization, procedures, resources, and documentation regarding the inspection, inventory, and maintenance operations for bridges. In addition, field reviews of six bridges were conducted to determine if ratings were consistent with the ODOT Coding Manual and FHWA Recording and Coding Guide and to determine if inventory items were coded correctly. The bridges were selected by Highland County to represent a variety of structure types and conditions. The bridges checked during the field review were:

SFN	CTY-RTE-SECT	TYPE	YEAR BUILT /REHAB	OVERALL LENGTH	County RATING	Suggested NBIS RATING
3630145	HIG C0033 04.800	321	1966	45'	6A	same
3630227	HIG C0003 01.100	195	2016	19'	9A	6A
3630277	HIG C0003 01.300	321	1966	42'	6A	5A
3632881	HIG T0273 00.480	321	1973	32'	7P	same
3631044	HIG C0017 01.080	321	1955	63'	4A	5A
3630188	HIG T0259 01.620	231	1988	25'	6A	same

FINDINGS AND COMMENTS:

General

Ohio State statutes establish requirements governing the safety inspection of all bridges within the State borders. ODOT with participation of FHWA has developed the ODOT publication Bridge Inspection Manual, hereafter referred to as the Manual, which establishes guidance and requirements regarding bridge inspections within the State. FHWA has determined that ODOT guidance meets or exceeds the FHWA NBIS requirements.

The federal regulations for administering the NBIS are located in the Code of Federal Regulations 23 Highways – Part 650 Subpart C - National Bridge Inspection Standards. The regulations can be found at the following web site:
https://www.govinfo.gov/content/pkg/CFR-2011-title23-vol1/pdf/CFR-2011-title23-vol1-part650-subpartC.pdf

Ohio currently rates bridge element conditions with a 1-4 scale. Summary items conform to the definitions and rating scales established by the NBIS. The NBIS do not require element level condition rating for County bridges unless they are on the expanded National Highway System (NHS) beginning October 1, 2014.

Highland County has inspection responsibilities for 280 bridges, 164 of which are longer than 20 feet in length and 116 which are 10 feet to 20 feet long. The NBIS inspection and load rating requirements only pertain to highway bridges in excess of 20' long on public roads. Review of the inventory span lengths showed that all bridges had the NBIS designation Y/N coded correctly. However, 3 bridges needed review of Item 48 Span and Item 306 NBIS length.

The office review and the field review demonstrated that County personnel were inspecting and coding bridges in accordance with ODOT's Bridge Inspection Manual ("Manual).

Inspection Procedures

Highland County uses their own staff to do the inspections. Previous inspection reports are available at site for review. The inspections are recorded on laptop with bridge software. Any changes or findings are recorded on paper also. Comments are recorded and brought to the bridge. Bridge plans are not carried to the bridge site for review, but are available at the bridge office. Photos are available for every bridge and are taken of defects during inspections.

The County indicated that an average of 15 inspections per day were completed in 2018. For Truss (pony/through/deck) it takes about 1 hour. It takes 0.33 hours for Beam/Girders. For a slab, it takes 0.25 hours. For a Culvert, it takes 0.25 hours.

The County has 30 bridges that require a snooper for inspection. They have their own snooper and is used on each bridge every other year depending on condition.

Frequency of Inspections

Ohio State Transportation Laws require all State and local bridges to be inspected annually. Highland County had 282 bridges inspected in 2018. The NBIS maximum inspection frequency of two years is met. All Bridges over 10 feet in length are inspected annually. There are no bridges that requires inspection more frequently than one year. Bridge inspection frequency is determined by Christopher Fauber, County Engineer, in conjunction with Engineering and site evaluation. A P.E. or E.I.T. is always present during inspections.

Qualification and Duties of Personnel

Mr. Christopher Fauber is the County Engineer. As such he has final responsibility for the bridge program. He is the Reviewer, he is a PE and has 12 years of inspection related experience. He took the ODOT Bridge Level 2 Inspection Course in 2011. He is qualified to be the Program Manager and Reviewer.

Mr. Christian Dunlap is the Program Manager. Mr. Dunlap has 3 years of inspection related experience. He is an E.I.T. and took the ODOT Bride Level 2 Inspection Courses in 2018. Mr. Dunlap is qualified as Team Leader.

Mr. Gary Martin is a Team Leader. He has 25 years of inspection related experience. He took Bridge Inspection Level 2 in 2011 and numerous other years. He also took a Bridge Inspection Refresher Course in 2017. Mr. Martin is qualified to be a Team Leader.

Mr. John Etienne is a Team Leader. He has 9 years of inspection related experience. He took Bridge Inspection Level 2 in 2011 and numerous other years. He also took a Bridge Inspection Refresher Course in 2017. Mr. Etienne is qualified to be a Team Leader.

Christopher Fauber (PE 72239) is responsible for doing the Load Ratings.

Inspection Reports

As part of this review, six bridges were field reviewed to compare conditions with the most recent inspection report. The individual condition ratings for five bridges properly reflected the field conditions within the tolerance of 1 rating value when compared to the Manual. One bridge out of tolerance is SFN 3630277. It is a culvert and had seams that rated a 2, not 1, which dropped the Summary from 9 to 6. Summary ratings correspond with the NBIS inspection items.

Inventory Items

During the Field Review, the CEAO QA/QC Engineer checked select inventory items and the following issues were found:

- SFN 3630145
  - Latitude and longitude needs corrected
- SFN 6360227
  - Seams (c47) needs to be 2 and not 1
  - General Appraisal should be 6A and not 9A
- SFN 3630277
  - SLM should be 11.02, make correction with Kammy at ODOT
  - Substructure Summary (N60) should be 5 and not 6 due to scour
  - Superstructure Summary needs to be 5 not 6 due to section loss in beam 6 at brg.
  - Channel Alignment should be 2 and not 1 due to channel hitting 1 side
  - General Appraisal should be 5A and not 6A
  - Latitude and Longitude needs to be checked
  - Comments need to be detailed since GA=5
- SFN 3632881
  - Approach Guardrail needs to be 2 and not 1
  - Substructure Summary needs to be 7 and not 8
  - Latitude and Longitude need to be checked
  - Approach Alignment item 72 needs to be 8 and not 5
  - Scour item 113 needs to be 5 and not 8

- SFN 3631044
    - Deck Summary should be 7 and not 8 due to rebar showing
    - Channel Alignment needs to be 2 and not 1 due to channel hitting SW cor
    - General Appraisal needs to be 5A and not 4A
    - Superstructure Summary shows 4, need detailed comments to justify the 4.
    - Latitude and longitude needs to be checked
    - Need detailed comments with quantities
- SFN 3630188
    - Latitude and Longitude need to be checked
    - Scour item 113 needs to be 5 and not 8

Files

Highland County keeps inspection reports, including old inspections in folders. After 2007, the files are on the server digitally. Design calculations are kept on files and in the bridge folder. Plans are kept both in the plan drawer as well as the folder. Load analysis calculations are in the folders along with a digital copy on the server. Inventory forms are kept on the server. Photos, sketches, scour evaluations, scour POA's, fracture critical files, load posting/closing documents, and flood data are all kept in folders. Repairs and maintenance history are both in folders and in the SMS.

Load Rating

The inventory shows 164 (100.00%) of the County bridges have been Load Rated or Load Rating was not applicable. There was 1 bridge evaluated by documented engineering judgement.

Load Ratings were checked for SFNs 3632601, 3632482, 3630145, 3632881. The load posting at the bridge matched the load rating on all bridges. P.E. name and stamp were on all load ratings.

Load Posting

Highland County has 9 bridges that are load posted. This is determined by a mix of both engineering judgment and analysis. There are 0 bridges closed for condition ratings. Posting is based on Operating Rating.

Special Features

Highland County does not have any bridges that have special features.

Fracture Critical Bridges

The FC bridge inspection frequency is yearly unless severity dictates, then it is every 6 months. SFN 3632601 and SFN 3632482 were both reviewed. FCM's were not identified and Fatigue Prone details were not shown. The procedure for both were detailed. There are 3 bridges with gusset plates. No calculations were available on the gusset plates. The county needs to search for the gusset plate calculations, and if none are found, need to do gusset plate calculations on the 3 trusses. They also need to show the Fracture Critical members and fatigue prone details in the files.

Underwater Inspections and Scour

There are 0 bridges require underwater inspections. There are 277 bridges considered scour susceptible and 10-15 bridges that are inspected by probing.

QA/QC

The QA/QC section of the 2014 Bridge Inspection Manual meets the FHWA requirement. Bridge inventory is constantly kept up to date. As soon as a change is made to a bridge is when the inventory is checked for needed updates. Inventory date is input into the system by being directly uploaded to SMS. The county has been sending the updated inventory to ODOT yearly, but it needs to be done every 180 days if there are changes made.

Inventory QA are performed during the inspection process yearly.

Critical Findings

The county does have a Critical Findings Procedure in place located in the SMS. Inspectors notify the County Engineer, Deputy Engineer, and Highway Superintendent when emergency repairs or critical findings are necessary. They inform maintenance personnel of routine bridge maintenance problems with a written project request form. If a bridge requires emergency repairs it is noted on the project request form for repairs. The inspection team are the ones who checks proper placement of signs. They were instructed to use the SMS Critical Findings Report.

Bridge Maintenance

The NBIS inspection and load rating requirements only pertain to highway bridges in excess of 20’ long on public roads.

Highland County does contract bridge work as needed. The work includes federal bridge projects, 4-sided Box’s, Guardrail projects, and Bridge Beam replacements. Fed funds are used on average for 1 project every 5 years. Credit Bridge Funds are not used.

The county uses in-house staff that consists of 2-3 Engineering staff and 6-8 Maintenance staff. They use them to do bridge projects less than $100,000, 4-sided Box’s, small bridge projects, small span bridge beams replacement and concrete culvert installations. The approximate annual budget for in-house repairs and replacements is approximately $400,000,000.

Projects are identified and selected by annual inspections, accident reports, or reports from the general public. Repair items are documented on a work record. Major repairs are recorded in the SMS. Once the emergency is identified, engineering will perform an inspection. The inspection will determine if a repair is needed or if a road closure and a replacement is warranted. Either project is written up and reviewed by the County Engineer prior to work being developed by engineering or repair being done by a work crew.

County Personnel are the ones who do the work of emergency repairs. The County Engineer is empowered to order emergency road closures. They contact the Sheriff and emergency services. County crews then barricade and sign the closed structure.

CONCLUSIONS AND RECOMMENDATIONS

- SFN 6360227
  - Seams (c47) needs to be 2 and not 1
  - General Appraisal should be 6A and not 9A
- SFN 3630277
  - SLM should be 11.02, make correction with Kammy at ODOT
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  - Deck Summary should be 7 and not 8 due to rebar showing
  - Channel Alignment needs to be 2 and not 1 due to channel hitting SW cor
  - General Appraisal needs to be 5A and not 4A
  - Superstructure Summary shows 4, need detailed comments to justify the 4.
  - Need detailed comments with quantities
- SFN 3630188
  -
  - Scour item 113 needs to be 5 and not 8
- Need to fix 3 FC Bridges and 2 Dive Bridges where the Y/N label is blank; UNDO Approval and correct in 2019 inspection
- Need to provide more info for Item 9 Location for 4 bridges
- 3634345 should be a 171 str type based on the depth of fill. Correct str type and inspection in 2020 inspection.
- Channel photos are not done. Need to complete in the 2020 inspection cycle.
- Need to provide better detailed comments for bridges where GA<=5. Complete descriptive comments including photos or sketches are required.
- The county needs to search for the gusset plate calculations, and if none are found, need to do gusset plate calculations on the 3 trusses.
- The FC files need to show the Fracture Critical members and fatigue prone details in the files.

The chart on the following page is a review of the 23 Metrics used to measure NBIS compliance and the chart represents a **preliminary**, **unofficial** assessment of the county's level of compliance. Action steps for compliance are listed at the bottom. The actual assessments of NBIS compliance are made by FHWA, based on documentation, and any final determinations of compliance may differ from this preliminary assessment. The Metric 12 & 22

result below is based on the field review of the six bridges visited during the QAR using the NBIP Field Review Checklist - PY 2013, Minimum Level Review Items.

PRELIMINARY FHWA 23 Metric Matrix

23 metrics used by FHWA to measure NBIS compliance. Actual "score" by FHWA may differ.

Compliance Codes for the following Metrics:

(C)	Compliant
(SC)	Substantially Compliant
(CC)	Conditionally Compliant
(NC)	Not Compliant

Metric	Description	(C)	(SC)	(CC)	(NC)
1	State Bridge Inspection Organization				
2	Program Manager Qualification				
3	Team Leader Qualification				
4	Load Rating Engineer Qualification				
5	UW Bridge Inspection Diver Qualification				
6	Routine Inspection Frequency - Low Risk				
7	Routine Inspection Frequency - High Risk				
8	UW Inspection Frequency - Low Risk				
9	UW Inspection Frequency - High Risk				
10	FC Inspection Frequency				
11	Frequency Criteria				
12	Inspection Quality **				
13	Load Rating				
14	Posted or Restricted Bridges				
15	Bridge Files				
16	FC Bridges				
17	UW inspection procedures				
18	Scour Critical Bridges				
19	Complex Bridges				
20	QC/QA				
21	Critical Findings				
22	Inventory **				
23	Updating of Data				

** based on results of Field Review

Metric	Action Needed
12	need detailed comments when GA<=5,
16	add FCMs and FPDs to FC files. Do gusset plate load ratings on all trusses w/ GPs