National Bridge Inspection Standards & Bridge Maintenance Program Review Jefferson County September 24, 2019

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

IN ATTENDANCE:

Shannon Gosbin
Kara Bernhart
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SCOPE OF REVIEW:

The review consisted of interviews with Jefferson County personnel, reviews of inspection and inventory data, and reviews of Jefferson County bridge records. The office evaluation assessed Jefferson 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 Jefferson 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
4130960	JEF T0380 00.890	34A	1968	95'	6A	same
4130103	JEF C0056 08.800	171	1927	14'	7A	same
4130138	JEF C0056 10.370	395	1928	10'	6A	5A
4130987	JEF C0056 03.700	444	1997	93'	7A	same
4130154	JEF C0056 12.370	322	1969	171'	6A	same
4131029	JEF T0373 03.200	231	1900	27'	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:
http://wwwcf.fhwa.dot.gov/legsregs/directives/fapg/cfr0650c.htm

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.

Jefferson County has inspection responsibilities for 209 bridges, 121 of which are longer than 20 feet in length and 88 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 10 bridges had the NBIS designation Y/N possibly coded incorrectly. The county should check the f-f abutment distance and make corrections to 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

Jefferson County uses their own staff to do the inspections. Previous inspection reports are available at site for review. Bridge inspections are recorded on paper. Comments are recorded on inspection sheets and then transferred to a Needs spreadsheet. They are brought to the bridge. Bridge plans are not carried to the bridge site for review, but are available if they have them. Photos are available for every bridge, and photos are taken of defects during inspection.

The County indicated that an average of 10-15 inspections per day were completed in 2018. Truss (pony/through/deck) takes 30 minutes depending on size and if it is a FC inspection. It takes 30 minutes for Beam/Girders. For a slab, it takes 15 minutes. For a Culvert, it takes 15 minutes.

The County does not have any bridges that require a snooper for inspection.

Frequency of Inspections

Ohio State Transportation Laws require all State and local bridges to be inspected annually. Jefferson County had 225 bridges inspected in 2018. The NBIS maximum inspection frequency of two years is met. All Bridges over 10 feet in length are inspected annually. The Program Manager based on inspection reports determines the need for a routine inspection frequency greater than once a year. There are a 17 bridges that requires inspection more frequently than one year. SFN 4130243, 4130219, 4130332, 4130715, 4131126, 4131398, 4131789, 4131827, 4131886, 4131924, 4132300, 4132475, 4132548, 4133048, 4133102, 4133293, 4133579. The frequency is "as needed" following large storm events. Normally they don't file new reports unless they find something new.

Qualification and Duties of Personnel

Mr. James Branagan is the county engineer, a PE, and as such has the final authority over the bridge program.

Ms. Kara Bernhart is the Program Manager, Reviewer, and Team Leader. She has 11 years of inspection related experience. She took the Bridge Inspection Level 1 and Level 2 Courses in 2008. She also took a Scour Assessment in 2008. She took an Element Level Bridge Inspection Course in 2016. Ms. Bernhart is qualified as Program Manager, Program Reviewer, and Team Leader.

Ms. Shannan Gosbin is a Team Leader. She has 5 years of inspection related experience. She took Bridge Inspection Level 1 and Level 2 in 2014. She also took an Element Level Bridge Inspection Course in 2016. Ms. Shannan Gosbin is qualified to be a Team Leader.

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 all six bridges properly reflected the field conditions within the tolerance of 1 rating value when compared to the Manual. 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 4130960
  - N36 – Safety Features items 36(A-D) all need to be 0 and not 1
  - Scour code item 113 needs to be 5 and not 8
- SFN 4130103
  - Beams/Girders should not be rated, but Slab should be 1. This is a SMS bug and the county should check all slabs and move the rating to the slab line if needed.
  - Abutment Caps item c34 should not be rated since the wall abutment does not have a cap
- SFN 4130138
  - Culvert Shape should be 2 instead of 1
  - Culvert Scour should be 2 instead of 1
  - Culvert Summary should be 5 and not 6
  - General Appraisal should be 5A and not 6A
  - Detailed comments are needed since the GA=5
  - Method of Analysis item 63 should be checked for possible engineering judgment
- SFN 4130987item c7.1
  - Guardrail Safety Features item 36(A) should be 0 and not 1
  - Approach Alignment item 72 should be 8 and not 6
- SFN 4130154

    - Floor/Slab should be 1 and not 2
    - Deck Summary should be 7 and not 6
    - Abutment Walls item c33 should be 1 and not 2
    - Abutment Caps item c34 should not be rated since the single wall does not have a cap
    - Pier Walls item c36 should not be rated since the piers are cap and column type
    - Substructure Scour item c42 should be 2 and not 1
- SFN 4131029
    - N36 – Safety Features items 36(A-D) all need to be 0 and not 1
    - Wearing Surface item c8 should be 3 and not 2
    - Beams/Girders item c15.1 should be 2 and not 1
    - Channel Alignment item c51 should be 2 and not 1
    - Channel Summary should be 6 and not 7
    - Superstructure Summary should be 6 and not 8

Files
Jefferson County keeps all information and documents in the filing cabinet in the production room. Older projects are kept in the loft above the garage.

Load Rating
The inventory shows 121 (100.00%) of the County bridges have been Load Rated or Load Rating was not applicable. There were 34 bridges evaluated by documented engineering judgement. BR100's were not done for the engineering judgment bridges, so the county will do those.

Load Ratings were checked for SFNs 4130154, 4130103, 4131029, 4130243. The load posting at the bridge matched the load rating on all bridges. P.E. name and stamp were not on any of the load ratings except for SFN 41310243. The other three all need a cover letter.

Load Posting
Jefferson County has 16 bridges that are load posted. There is 1 bridge closed for condition ratings. They use a mix of engineering judgment and analysis. The type of sign used for load posting is gross tonnage, but they will start using the large SHV signs. Posting is based on the Operating Rating Factor.

Special Features
Jefferson County does not have any bridges that have special features. They thought SFN 4131126 had unique or special features, but it is okay. It has a pin connected truss.

Fracture Critical Bridges
There are 14 FC bridges. The FC bridge inspection frequency is yearly. Jefferson County had SFN 4130332 and SFN 4130790 were reviewed. They both had FCM's identified. They both need to show the Fatigue Prone details and need to have the Inspection Procedure detailed. The county indicated they would do this for all FC bridges.

Underwater Inspections and Scour

There are 0 bridges require underwater inspections. There are 3 structures no over waterways considered scour susceptible and approximately 50 bridges inspected by probing. There are 0 bridges that are scour critical. Channel Photos are mostly done but will be redone in 2020.

QA/QC

The QA/QC section of the 2014 Bridge Inspection Manual meets the FHWA requirement. Quality Assurance checks are reviewed at inspection report approval. Inventory is checked for needed updates as it is requested. Inventory data is input into the system manually. Updated inventory data needs to be forwarded to ODOT within 180 days. When changes are discovered during inspection and/or changes from new construction or rehab, the updated inventory data is forwarded to ODOT as soon as it is inputted into the system.

Critical Findings

The county does have a Critical Findings Procedure in place located in the SMS. Maintenance problems are identified on the bridge inspection form. Inspectors inform maintenance personnel of routine bridge maintenance problems written and orally. Inspectors notify Clay Merrin, Chief Deputy Engineer, or Allan Hammer, General Superintendent, when emergency repairs or critical findings are necessary. It is documented written and orally. If a bridge requires emergency repairs, it would be noted on the inspection report. The Inspection Team and Scott Fabian, Highway Safety Director, are the ones that check 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. Review of the inventory span lengths showed that all bridges had the NBIS designation Y/N coded correctly.

Jefferson County has maintenance responsibilities for 209 bridges, 121 of which are longer than 20 feet in length and 88 which are 10 feet to 20 feet long. The County does force account bridge work as needed. The work includes replacements and steel repairs. The approximate budget is $1,000,000. Funds and Credit Bridge Funds are used.

The county uses in-house staff that consists of a combination of highway workers as well as roadway workers. They use them to do small span replacements of box culverts/pipe arches as well as minor maintenance. The approximate budget is $100,000.

Projects are identified after the annual inspections are completed and the maintenance list is updated. Projects are selected based on need and severity. Plans are developed in house where priority is given. Depending on the project, in-house or contractors are the ones who do the work of the emergency repairs. Repair work is documented on work records. When there are emergency road closures, management contacts 911, the school district, and the media.

CONCLUSIONS AND RECOMMENDATIONS

- SFN 4130960
    - N36 – Safety Features items 36(A-D) all need to be 0 and not 1
    - Scour code item 113 needs to be 5 and not 8
- SFN 4130103
    - Beams/Girders should not be rated, but Slab should be 1. This is a SMS bug and the county should check all slabs and move the rating to the slab line if needed.
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    - Approach Alignment item 72 should be 8 and not 6
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    - Floor/Slab should be 1 and not 2
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    - Abutment Walls item c33 should be 1 and not 2
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    - Superstructure Summary should be 6 and not 8
    -

The following items were detailed on lists given to the county:

- They will double check the f-f distance and correct Item 306 NBIS length if needed on 10 bridges
- SFN 4133277 needs to be changed to FC=N
- They will add FC and Dive Required Y/N coding on the 2020 Inspection for 19 bridges.
- They will complete the plan info item 709 for 10 bridges.
- There is an error in 2011 Load Rating for 4131886. They will re-evaluate now and make necessary corrections
- They will update the Load Ratings and no longer use Engineering Judgment for 4132238, 4133609.
- SFN 4131886 – % Legal doesn't' match posting – will check and make necessary changes

- Will fix the Ohio Percent Legal Load Rating for 4130228, should be 120%
- Will change the name of Legal Load – it is incorrect on 3 bridges
- Legal Load RFS should not equal each other except when Method of Rating = 0,4,5,D,F, or metal culverts – will check and fix if needed on 4 bridges
- Legal load data missing on 4130980, 4130422
- Will fix OP Rat Factor Errors as part of load rating re-evaluation for, 4131886
- Will look into Overdue BIM Inspection, it exceeded 18 months, but temporary bridge involved
- Will prepare a BR100 for Engineering Judgment bridges
- Scour photos will be redone in 2020
- Will prepare FC Insp Procedure and Fatigue Prone details for all FC bridges.

The chart on the following page is a review of the 23 Metrics used to measure NBIS compliance and the chart represents a **preliminary**, **tentative** 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 on the following page 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 ** 96%				
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 ** 87%				
23	Updating of Data				

** based on results of Field Review

Metric	Action Needed
16	FC Inspection Procedure and FP details need to added to the file