National Bridge Inspection Standards & Bridge Maintenance Program Review Fairfield County October 15, 2019

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

IN ATTENDANCE:

Jennifer Donley
William Maravy
Tim Anderson
Mark Stockman, CEAO Federal Bridge QA/QC Engineer

SCOPE OF REVIEW:

The review consisted of interviews with Fairfield County personnel, reviews of inspection and inventory data, and reviews of Fairfield County bridge records. The office evaluation assessed Fairfield 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 Fairfield 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
2332353	FAI C0023 2.461	195	1917	12'	5P	4P
2332620	FAI T0182 5.848	321	1988	48'	6A	7A
2330024	FAI C0016 4.532	112	1970	82'	7A	same
2333260	FAI C0041 2.785	321	1900	44'	6A	5A
2335166	FAI T0205 00.768	321	1900	26'	6A	5A
2330652	FAI M0048 1.659	231	1973	46'	6A	4A

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.

Fairfield County has inspection responsibilities for 345 bridges, 235 of which are longer than 20 feet in length and 110 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 19 bridges had the NBIS designation Y/N possibly coded incorrectly. The county will need to check the f-f abutment distance and correct Item 306 NBIS Length or item 48 Maximum Span if needed.

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

Inspection Procedures

Fairfield County uses their own staff to do the inspections. Previous inspection reports are available at site for review. The inspection data is input directly into SMS at the bridge. Comments are recorded in SMS and on a spreadsheet and brought to the bridge. Many bridges need to improve their comments. 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 10 inspections per day were completed in 2018. For Truss (pony/through/deck) it takes about 30-60 minutes. It takes 15-45 minutes for Beam/Girders. For a slab, it takes 15-45 minutes. For a Culvert, it takes 15-45 minutes.

The County has 1 bridge that require a snooper for inspection. They use it on the bridge every 2 years.

Frequency of Inspections

Ohio State Transportation Laws require all State and local bridges to be inspected annually. Fairfield County had 345 bridges inspected in 2018. Inspections are done October through December every year. The NBIS maximum inspection frequency of two years is met. All Bridges over 10 feet in length are inspected annually. There are a couple bridges that requires inspection more frequently than one year (BER-10 and BLO-09) that are done semiannually. Bridge inspection frequency is determined by the Program Manager. Need is based upon the structural integrity of the bridge.

Qualification and Duties of Personnel

Mr. Jeremiah Upp, P.E. is the County Engineer and had final authority over the bridge program.

Mr. William Maravy, P.E., is the Program Manager and Reviewer. He has 3 years of inspection related experience. He took the ODOT Bridge Inspection Level 1 and 2 in 2017. Mr. Maravy is qualified as Program Manager and Reviewer.

Mr. Tim Anderson is a Team Leader. He has 17 years of inspection related experience. He took Bridge Inspection Level 1 in 2004 and Level 2 in 2007. He took LTAP ODOT Manual of Bridge Inspection Update in 2011 and a Fracture Critical Techniques for Steel Bridges in 2013. He also took a Bridge Inspection Refresher Course in 2017. Mr. Anderson is qualified to be a Team Leader.

Ms. Jennifer Donley is a Team Leader. She has 14 years of inspection related experience. She took Bridge Inspection Level 1 and Level 2 in 2007. She took a Manual of Bridge Inspection Update in 2011. She also took a Bridge Inspection Refresher Course in 2017. Ms. Donley is qualified to be a Team Leader.

Mr. Dustin Matthews is a Team Leader. He has 6 years of inspection related experience. He took ODOT Bridge Inspection Level 1 and Level 2 in 2015. Mr. Matthews is qualified to be a Team Leader.

Mr. Jason Grubb is a Team Member. He has 2 years of inspection related experience. He took both ODOT Level 1 and Level 2 in 2017. Mr. Grubb is qualified to be a Team Member.

William Maravy (PE 71811) 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 all six bridges with the exception of 1 bridge that was sampled, properly reflected the field conditions within the tolerance of 1 rating value when compared to the Manual. The one exception was SFN 2330652 where 5 strands were visible, and up to 12 strands should be discounted. The Superstructure Summary Rating should be 4, not 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 2332353
    - General item c44 under Culvert Items should be 3 and not 2
    - Culvert Summary should be 4 and not 5
    - General Appraisal should be 4P and not 5P
    - Needs complete comments since the GA was 5 or less.

- SFN 2330024
  - Scour code Item 113 should be 5 and not 8
- SFN 2333260
  - General Appraisal should be 5A and not 6A
  - Superstructure Summary should be 5 and not 6
  - Scour item 113 should be 5 and not 8
  - Comments need to be improved
  - Item 409 Deck Drainage needs to be changed to show with drip strip
- SFN 2335166
  - General Appraisal under sign/utility items should be 5A and not 6A
  - Superstructure Summary should be 5 and not 6
  - Load rating should be updated, shows 150% but bridge condition indicates might be lower.
  - Comments need to be improved since GA=5
- SFN 2330652
  - Superstructure Summary should be 4, not 6, and General Appraisal should be 4A and not 6A. 5 strands were visible and 12 strands should be discounted. If the county uses a hammer to determine the soundness of the concrete, they could lower the discounted strands. Until then, they should assume that the concrete is not sound and discount the maximum.
  - Ohio Percent Legal needs to be updated
  - Detailed comments are needed since the GA was lowered to 4.

Files
Fairfield County keeps all files for everything in the file room. Everything is on paper and on the computer in files.

Load Rating
The inventory shows 235 (100.00%) of the County bridges have been Load Rated or Load Rating was not applicable. There were 6 bridges evaluated by documented engineering judgement. The county indicated they will prepare BR100's for these bridges.

Load Ratings were checked for SFNs 2334127, 2334224, 2330016, 2336651. 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
Fairfield County has 8 bridges that are load posted. This is determined by a mix of both engineering judgment and analysis – it varies on the bridge. There are 0 bridges closed for condition ratings. They use SHV signage. Posting is based on Operating Rating.

Special Features
Fairfield 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 2334224 and SFN 2334127 were both reviewed. FCM's were identified and Fatigue Prone details were shown, but needs improvement. The procedure for both were detailed, but also needs improvement. There are 13 bridges with gusset plates.

Underwater Inspections and Scour

There are 0 bridges require underwater inspections. There are 0 bridges considered scour susceptible and the number varies of bridges that are inspected by probing. The need is determined by the Team Leader in the field.

QA/QC

The QA/QC section of the 2014 Bridge Inspection Manual meets the FHWA requirement. Bridge inventory is constantly kept up to date. Conflicts are discovered during inspections. Inventory is checked for needed updates when needed due to discrepancies discovered during inspections. When notified by CEAO or ODOT that an item needs checked, it is done also. The county needs to be forwarded to ODOT 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. A spreadsheet/list is created and it is logged in the PubWorks. The list is then audited by the Program Manager and passed onto the bridge maintenance crew. Repairs are then inspected by the Program Manager and/or a Team Leader. If a bridge requires emergency repairs, the Program Manager is notified, and it is logged into PubWorks. It is documented in SMS and/or daily worksheets. Emergency repairs are placed on the bridge maintenance list in PubWorks and reported to the Program Manager. The Bridge Inspection Crew and the Sign Crew 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. Review of the inventory span lengths showed that all bridges had the NBIS designation Y/N coded correctly.

Fairfield County has maintenance responsibilities for 345 bridges, 235 of which are longer than 20 feet in length and 110 which are 10 feet to 20 feet long. The County does force account bridge work as needed. The work includes bridge replacements, bridge rehabilitations, and major repairs. The approximate annual budget is $500,000. Fed funds and Credit Bridge Funds are both used.

The county uses in-house staff that consists of 1 supervisor and 3-5 road workers. They use them to do bridge replacements, bridge rehabilitations, and major repairs. The approximate annual budget for in-house repairs and replacements is approximately $100,000.

Projects are identified and selected by the following – Potential bridge replacement projects are identified by bridge condition, bridge load rating, and whether a bridge is functionally obsolete. The main criteria used for bridge replacement selection is the bridge condition. The secondary criteria is whether a bridge is load rated or functionally obsolete. Potential bridge repair projects are identified during the annual bridge inspections. Bridge repair projects are prioritized based upon potential structural failure, safety of roadway, ensuring longevity of bridge structure, and maintaining waterway adequacy.

The plan developed for repairs varies upon the extent of repairs needed and the type of repairs needed. Repairs are done by county forces under the direct supervision of the Program Manager or by contract form plans/specifications developed under the direct supervision of the Program Manager. Depending upon the extent of repairs needed and the type of repairs needed, they are done by cunty forces, contractors, or by a combination of both.

A repair/maintenance list is maintained by the Program Manager. This repair/maintenance list is added to annually by the bridge inspection teams during annual bridge inspections. The repairs and maintenance are done by the County Bridge Crew or Contract Labor depending upon the size and complexity of work needed. All repair/maintenance work is inspected by the Program Manager or a Team Leader prior to acceptance. Jeremiah Upp, County Engineer; Bill Maravy, Deputy Engineer; and Eric McCrady, Deputy Engineer are all empowered to order emergency road closures.

CONCLUSIONS AND RECOMMENDATIONS

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lower the discounted strands. Until then, they should assume that the concrete is not sound and discount the maximum.
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The following items were detailed in lists given to the county:

- EV2 and EV3 RF are both = 1.500 on 7 bridges . They cannot be the same, so will fix
- Will check if a 23 ton truck can be the same RF as a 34.75 ton truck for 2331535
- Will put the name of vehicle in Legal Load 4 – it is missing for 2335735
- They will change Item 70 to a '3' for 2330458
- Will fix EV sign recommendation to match RFs for 2330458
- Will check item 306 for all 10 Main Structure Types that equal 171 and 195. Item 306 should = item 48.
- Will fix Str Type to not be "Other" on 2332191
- Will check if engineering judgment bridges have a BR100
- Will check load rating for a "TYPO" on 2330601 and 2330232
- 2330458 shows OP Status=A but 86% Legal. Change to P in In-Progress inspection
- Will check and fix Item 734 percent legal, should be 125 for 2336081
- 19 bridges had the NBIS designation Y/N possibly coded incorrectly. The county will need to check the f-f abutment distance and correct Item 306 NBIS Length or item 48 Maximum Span if needed.

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 **				
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	add detailed comments when GA<=5, check strand discount on prestressed boxes
13	various load rating items need reviewed and checked, including EV ratings