National Bridge Inspection Standards & Bridge Maintenance Program Review Crawford County September 26, 2019

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

IN ATTENDANCE:

Bryan Waines
Jason Long
Mark Stockman, CEAO Federal Bridge QA/QC Engineer

SCOPE OF REVIEW:

The review consisted of interviews with Crawford County personnel, reviews of inspection and inventory data, and reviews of Crawford County bridge records. The office evaluation assessed Crawford County's organization, procedures, resources, and documentation regarding the inspection, inventory, and maintenance operations for bridges. In addition, field reviews of five 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 Crawford 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
1739131	CRA C0039 00.740	112	1966	132'	6A	same
1733168	CRA C0001 07.030	395	1980	30'	7A	6A
1733206	CRA C0001 09.660	112	1962	117'	6A	same
1738143	CRA T0032 06.230	231	1974	33'	6A	same
1740954	CRA C0056 00.610	321	1968	22'	6A	7A

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.

Crawford County has inspection responsibilities for 195 bridges, 126 of which are longer than 20 feet in length and 69 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.

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

Crawford County uses their own staff to do the inspections. Previous inspection reports are available at site for review. Bridge inspections are recorded electronically and entered into SMS via laptop. There is a Wi-Fi hotspot at the bridge site. Comments are recorded into SMS. They are 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 photos are taken of defects during inspection.

The County indicated that an average of 20 inspections per day (10 per day per inspector) were completed in 2018. Truss (pony/through/deck) takes 30 minutes. It takes 30 minutes for Beam/Girders. For a slab, it takes 30 minutes. For a Culvert, it takes 15 minutes.

The County has 0 bridges that require a snooper for inspection.

Frequency of Inspections

Ohio State Transportation Laws require all State and local bridges to be inspected annually. Crawford County had 400+ 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 Inspectors and County Engineer determines the need for a routine inspection frequency greater than once a year. It is used for bridges that are rapidly changing as well as worsening defects that are not critical but could become critical. There are 0 bridges that requires inspection more frequently than once a year.

Qualification and Duties of Personnel

Mr. Mark Baker is the County Engineer, Program Manager and Program Reviewer. He is a PE and has 15 years of inspection related experience. He took the Comprehensive Bridge Inspection Program (ODOT) in the Spring of 2009. He took Load Rating with BARS in 2008.

He took SMS Training in 2013. And he took an Inspection Refresher in 2017. Mr. Baker is qualified as Program Manager and Program Reviewer.

Mr. Jason Long is the Team Leader. He has 18 years of inspection related experience. He took Comprehensive Bridge Inspection Program in 2001. He took Scour Assessment Training and Load Rating with BARS-PC in 2008. He took an Inspection Refresher in 2017. Mr. Long is qualified as a Team Leader.

Mr. Bryan Waines is a Team Leader. He is an EIT and has 5 years of inspection related experience. He took Comprehensive Bridge Inspection Program in 2016. He also took an E.I. Certification in 2017. He will need to take a Refresher Course in 2021. Mr. Waines is qualified to be a Team Leader.

Mr. Mark Baker (PE 66685) is the Load Rating Engineer.

Inspection Reports

As part of this review, five bridges were field reviewed to compare conditions with the most recent inspection report. The individual condition ratings for all five 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 0173168
  - Culvert General item c44 should be 2 not 1 because of pitting and rust
  - Culvert Summary should be 6 and not 7
  - General Appraisal should be 6 and not 7
- SFN 1733206
  - Abutment Caps should not be coded since the abutment is a single wall without a cap
- SFN 1740954
  - Abutment Walls should be 1 and not 2 due to only 1% delam
  - Substructure Summary should be 7 and not 6
  - Prot. Coating System should be 3 and not 2
  - General Appraisal should be 7 and not 6
  - Scour code item 113 should be code 5 not 7
- SFN 1738143
  - Scour code item 113 should be 5 not 7

Files

Crawford County keeps all bridge plans and construction documents kept in file room in office. Each bridge has a file. Inspection reports kept in file cabinet in Jason’s office. Load rating files

(one per bridge) are kept in an office file cabinet located in the common area. Scour critical and fracture critical master lists are posted in the file room. Load posting information is kept in the bridge load rating file for corresponding bridge. Maintenance history is kept in the main bridge file in file room, along with any photos.

Load Rating

The inventory shows 126 (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. BR100 forms are complete for these bridges

Load Ratings were checked for SFNs 1738429, 1746391, 1745026, 1730001. The load posting at the bridge matched the load rating on all bridges. P.E. name and stamp were on all bridges, except for SFN 1738429 which needs a cover letter. There was documentation for all of the bridges.

Load Posting

Crawford County has 4 bridges that are load posted. There are 3 bridges closed for condition ratings. They use analysis to determine if bridges are load posted. The type of sign used for load posting is SHV. Posting is based on Operating. There are 3 bridges that have gusset plates, are FC and are all closed.

Special Features

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

Fracture Critical Bridges

The FC bridge inspection frequency is yearly. All 3 Fracture Critical bridges have been closed.

Underwater Inspections and Scour

There are 0 bridges require underwater inspections. There are 194 bridges considered scour susceptible and 0 bridges inspected by probing. There are 0 bridges that are scour critical.

QA/QC

The QA/QC section of the 2014 Bridge Inspection Manual meets the FHWA requirement. Quality Assurance checks are performed during inspection and periodically audited by CEAO QA/QC. Inventory is checked for needed updates during inspection and whenever bridge features change. Inventory data is input into SMS. Updated inventory data is forwarded to ODOT as soon as it is entered into SMS. Changes are discovered during inspection as soon as inspection report is entered. Changes from new construction or rehab are updated as soon as construction is completed.

Critical Findings

The county does have a Critical Findings Procedure in place located in the SMS. Maintenance problems are not identified on the bridge inspection form. It is put on another form. Inspectors inform maintenance personnel of routine bridge maintenance problems written and orally. Inspectors notify the County Engineer, and Highway Superintendent when emergency repairs or critical findings are necessary. It is documented on inspection reports, and on the narrative

in the bridge file. If a bridge requires emergency repairs, it would be noted on the inspection report and on a separate document. The bridge inspectors are the ones that check proper placement of signs. They were instructed to use the SMS Critical Findings Report.

Bridge Maintenance

Crawford County has maintenance responsibilities for 195 bridges, 126 of which are longer than 20 feet in length and 69 which are 10 feet to 20 feet long. The County does force account bridge work as needed. The work includes total replacements and rehabilitations. The approximate budget is $400,000. Funds and Credit Bridge Funds are used.

The county uses in-house staff that consists of a staff of as many people as is needed. Typical work items are removals and box culvert installations. The approximate budget is $150,000.

Projects are identified and selected by looking at conditions observed during inspections. Plans for emergency repairs are developed typically in-house or a consultant, depending on the severity of the repair. Contractors or in-house staff are the ones who typically do the work of the emergency repairs. Repair work is documented on time cards and project worksheets. The County Engineer, bridge inspectors, highway superintendent are all empowered to order emergency road closures. Discussion and concurrence among the staff happens and then they notify the law and fire department.

CONCLUSIONS AND RECOMMENDATIONS

- SFN 0173168
    - Culvert General item c44 should be 2 not 1 because of pitting and rust
    - Culvert Summary should be 6 and not 7
    - General Appraisal should be 6 and not 7
- SFN 1733206
    - Abutment Caps should not be coded since the abutment is a single wall without a cap
- SFN 1740954
    - Abutment Walls should be 1 and not 2 due to only 1% delam
    - Substructure Summary should be 7 and not 6
    - Prot. Coating System should be 3 and not 2
    - General Appraisal should be 7 and not 6
    - Scour code item 113 should be code 5 not 7
- SFN 1738143
    - Scour code item 113 should be 5 not 7

- They will complete the Y/N item for FC and UW Y/N switch on 1730000 at the next Inspection
- Will check load ratings for engineering judgment bridges and revise if needed
- SFN 1738429 Load Rating Factor for Legal Load 3 or 4 needs to be 2.994 and not 2.537

- SFN 1745026 Percent Legal should be 150% legal. Item 64 is no longer capped at 3 and enter actual value. They will make corrections.

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 five 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 ** 100%				
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 ** 97%				
23	Updating of Data				

** based on results of Field Review

Metric	Action Needed