

National Bridge Inspection Standards & Bridge Maintenance Program Review Ross County May 28, 2019

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

IN ATTENDANCE:

Charles Ortman P.E., P.S.
Deric Cox, P.E.
Paul Cottrell
John Wetzel, P.E P.S.
Mark Stockman, CEAO Federal Bridge QA/QC Engineer

SCOPE OF REVIEW:

The review consisted of interviews with Ross County personnel, reviews of inspection and inventory data, and reviews of Ross County bridge records. The office evaluation assessed Ross 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 Ross 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
7138601	ROS C0127 01.500	395	1900	14'	5A	same
7146825	ROS C0223 00.420	321	1995	38'	7A	same
7147031	ROS C0223 03.030	131	2005	27'	6A	same
7136836	ROS T0101 00.480	111	1950	34'	6A	same
7147120	ROS C0223 06.210	231	1995	25'	6A	same
7146280	ROS C0222 07.440	322	1999	72'	5A	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:

<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.

Ross County has inspection responsibilities for 431 bridges, 233 of which are longer than 20 feet in length and 211 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"). There were some minor issues in regard to complete compliance with the National Bridge Inspection Standards (NBIS). Comments are listed below.

Inspection Procedures

Ross County uses their own staff to do the inspections. Previous inspection reports are available at site for review. The inspections are marked on a paper copy then entered in SMS in the office. Comments are recorded on the inspection form and brought to the bridge. The county was reminded that ratings of 5 and below require complete comments describing Location, Extent, and Severity (LES), including pictures and/or sketches.

The County indicated that an average of 8 inspections per day were completed in 2018. The inspections include some smaller bridges between 10'-20' as well as NBIS length bridges. For an average-sized bridge it takes 1 hour to inspect Beam/Girder and Truss bridges, and 30 minutes for slab and culvert bridges.

The County has 12 bridges that require a snooper for inspection. They use the snooper to inspect every 2 to 5 years.

Frequency of Inspections

Ohio State Transportation Laws require all State and local bridges to be inspected annually. Erie County had all 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 currently no bridges that require inspection more frequently than one year. The Team Leader and the County Engineer can determine if a bridge requires more than one inspection annually. To do this, they refer to the condition rating and critical findings.

Qualification and Duties of Personnel

Mr. Charles Ortman is the County Engineer. As such he is the final authority on the bridge inspection program..

Mr. Deric Cox is the Program Manager, and Load Rating Engineer. Mr. Cox is a P.E. and has 16 years of inspection related experience. He took the Bridge Inspection Level 1 and Level 2 in 2011 and the Bridge Inspection Refresher in 2017. Mr. Cox is qualified as Program Manager and Load Rating Engineer.

Mr. John Wetzel is the Reviewer and Load Rating Engineer. He is a P.E. with 11 years of inspection related experience. He took the Bridge Inspection Level 1 and 2 in 2011 and the Element Level Bridge Inspection Training in 2016. Mr. Wetzel is qualified as Reviewer and Load Rating Engineer.

Mr. Paul Cottrell is the Team Leader. He has 33 years of inspection related experience. Mr. Cottrell took the Bridge Inspection Level 1 and Level 2, multiple times, most recently in 2011. He also took the Element Level Bridge Inspection Training in 2016. Mr. Cottrell is qualified as 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. All discrepancies were discussed at the bridge site.

One issue was found:

- SFN 7146280
 - Comments need to be detailed, since the Summary is 5 or less. The comments need to be descriptive, including photos or sketches. For example, describing Location, Extent and Severity would be detailed enough.

Inventory Items

During the Office Review, the following issues were found:

- SFN 7134827 has 3 beams so Item 474 should be coded “2”
- SFN 7144431 has 5 girders so it is not FC. The county can make the change at the next inspection.
- SFN 7148453 should have item 474 coded as “other” code “0”

- The county was given a list of 27 bridges where the depth of fill on a 3 or 4 sided concrete box was less than 2' according the inventory. They were coded as 195 concrete culvert structure type instead of 171 concrete frame. The county indicated they will check the depth of fill and make corrections where needed.
- SFN 7133596 had the GVW wrong in the SMS load rating page. The correct entry for the GVW items 728 and 731 should be 31 for SU5 and 38.75 for SU7.
- The county was given a list of 19 bridges where the NBIS length was greater than the Max. Span. That is incorrect since the NBIS length is measured f-f abutment and should be less than or equal to the span. It is not expected that any would change the NBIS designation.
- 4 bridges (7144369, 7150555, 715276, 7153457) had the Operating Rating Factor shown as 3.00. The Operating Rating Factor is no longer capped at 3.00. The county is requested to check the load calculations and enter the actual value for the Operating Rating Factor.

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

- SFN 7146825
 - Scour Critical Rating should be changed from 8 to 5. It is stable and within footer limits instead and not above footer limits.
- SFN 7147031
 - Scour Critical Rating should be changed from 8 to 5. It is stable and within footer limits and not above footer limits.
- SFN 7146280
 - Substructure Abutments Wall (LF) should not be coded. Substructure Abutment Columns/Bents (EA) should be coded 3 instead of blank. Overall Substructure should be changed from 5 to 4.
 - General Appraisal should be changed from 5 to 4.
 - Scour Critical Rating should be changed from 8 to 5. It is stable and within footer limits and not above footer limits.

Files

Ross County maintains bridge files in the central control office and are filed by bridge number. Fracture Critical List, Bridges Posted List, Vertical Clearance List, etc. are kept in the first drawer. Some of the Load Rating Reports that are too large are kept in a separate file. All inventory forms are kept together in binders. Files contain inspection reports, design calculations, plans, load analysis calculations, inventory forms, photos and sketches, repairs and maintenance history, scour evaluation, scour POA, fracture critical files, Load

posted/closed, Underwater inspections, special inspection equipment or procedures, and flood data, waterway adequacy, and channel cross sections.

Load Rating

The inventory shows 223 (100.00%) of the County bridges have been Load Rated or Load Rating was not applicable. There were 14 bridges evaluated by documented engineering judgement. The County was also reminded that, during an inspection, any bridges that have the General Appraisal moved from a 5 to 4 will trigger a new load rating.

Load Ratings were checked for SFNs 7148070, 7143818, 7132352, and 7136838. 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

Ross County has 7 bridges that are load posted. This is determined by analysis. There are 0 bridges that closed for condition ratings. They are changing over to SHV signage. Posting is based on Operating Rating. Bridges are analyzed using BARS, ODOT Spread Sheets, and they are learning BrR.

Special Features

Ross County has one bridge with special features, SFN 7148453, which has pin and hanger connections and is located over Scioto River.

Fracture Critical Bridges

Ross County has 17 bridges labeled as a fracture critical bridge in the SMS. There are 14 with gusset plates.

Fracture critical files were checked for SFN 7135025 and SFN 7145071. Files did contain the identification of the fracture critical member, fatigue prone details, and details of the procedure.

Gusset plate calculations were checked for SFN 7135025. The P.E. name and stamp were present and the unstiffened edge test was performed.

Underwater Inspections and Scour

Underwater Inspections are performed by a consultant, Integrity Aquatic. There are 3 bridges that require underwater inspections. The bridges are SFN 7144369, SFN 7148453, and SFN 7150555 and were all inspected in June 2015. There are no bridges considered scour susceptible. Probing is used if visual inspection warrants.

Underwater files were checked for SFN 7150555. Files did contain the Procedure, location of underwater elements, and frequency of inspection was identified.

QA/QC

The QA/QC section of the 2014 Bridge Inspection Manual meets the FHWA requirement. In addition, bridges are inspected by a different team member every year.

Inventory QA are performed during the inspection process yearly. The county was reminded that the updated inventory data should be forwarded to ODOT at a maximum of 180 days.

Critical Findings

The county does have a Critical Findings Procedure in place. The County Engineer is notified when emergency repairs or critical findings are necessary and is documented using work orders. The county was advised to use the SMS Critical Findings Report.

Bridge Maintenance

The County has maintenance responsibilities for 431 bridges, 223 of which are greater than 20 feet in length and 208 between 10 feet and 20 feet in length. The County does force account bridge work as needed. The work includes anything over the force account limit. Approximately \$200,000 is budgeted for force account annually and the county uses it when available.

The county uses in-house staff to do in-house repairs and replacements. The staff includes Bridge Foreman, Bridge Worker, Equipment Operator, Highway Worker, and Engineering Support. Work performed on bridges include repairing deficient beams, remove deficient decks, and replace with concrete, prestressed or steel beams. The approximate annual budget for in-house repairs and replacements is \$250,000.

Projects are identified using load limit restrictions, structure ratings, and budget. The plans for emergency repairs are developed in-house and are also performed by the in-house staff. Repair work is documented in the daily log sheets and work orders. In an emergency, the County Engineer or designee are empowered to close roads. The County Sheriff is notified, who alerts other authorities, and the in-house staff is responsible for closing the road.

CONCLUSIONS AND RECOMMENDATIONS

- The county was reminded that ratings of 5 and below require complete comments describing Location, Extent, and Severity (LES), including pictures and/or sketches.
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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 ** 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