National Bridge Inspection Standards & Bridge Maintenance Program Review Harrison County May 29, 2019

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

IN ATTENDANCE:

Doug Bachman
Joe Ledger
Greg Tullis
Mark Stockman, CEAO Federal Bridge QA/QC Engineer

SCOPE OF REVIEW:

The review consisted of interviews with Harrison County personnel, reviews of inspection and inventory data, and reviews of Harrison County bridge records. The office evaluation assessed Harrison 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 Harrison 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
3432386	HAS T0219 21.910	195	2006	18'	6A	same
3430715	HAS C0041 41.380	221	1900	56'	5A	same
3430618	HAS C0013 13.134	321	1900	73'	6A	same
3431827	HAS C0005 05.031	111	1900	18'	6P	same
3431886	HAS C0005 05.510	322	1940	211'	5A	same
3433757	HAS C0004 04.230	695	1983	22'	4A	6A

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. Harrison County has 0 bridges on the expanded NHS.

Harrison County has inspection responsibilities for 145 bridges, 79 of which are longer than 20 feet in length and 66 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 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 regards to complete compliance with the National Bridge Inspection Standards (NBIS). Comments are listed below.

Inspection Procedures

Harrison County uses their own staff to do the bridge inspections. Previous inspection reports are available at site for review. The inspections are recorded on paper copy of previous year's inspection report. Comments are recorded on the inspection report from the previous year and brought to the bridge. The county was reminded that it needs Critical Findings Report.

The county indicated that an average of 7 inspections per day were completed in 2018. The inspections include some smaller bridges between 10'-20' as well as NBIS length bridges.

The County does not have any bridges that uses a snooper. The inspector uses photographs to document deficient bridge conditions, however, photographs are not available for every bridge.

Frequency of Inspections

Ohio State Transportation Laws require all State and local bridges to be inspected annually. Harrison County had 145 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.

Qualification and Duties of Personnel

Mr. Doug Bachman is the Program Manager and Reviewer. He is a PE in Ohio. He has 3+ years of inspection experience. He took the ODOT Bridge Inspection Training Level 1 and 2 in

2017. He took an Introduction to Safety Inspection of In-Service Bridges in 2017. He is qualified as Program Manager and Reviewer.

Mr. Joe Ledger is the Team Leader. He has had 23 years of experience. He took the ODOT Bridge Inspection Training Level 1 and 2 in 2018. He is qualified to be a Team Leader.

Mr. Greg Tullis is a Team Member. He has had 8 years of experience.

Mr. Doug Bachman, PE #74718 did the load ratings. Mr. Bachman is a PE in Ohio and is qualified to do 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 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.

Inventory Items

During the Office Review, 2 inventory problems were found.

- They do not have BR-100 forms for all the Engineering Judgement bridges. They will do this.
- They do not have load posting documentation or a filing system. They are working on this to have this done and in place.
- SFN 3431851, 3431886, 3431177, 3430456show 150% legal but the Op RF is less than 75%. The load rating data should be checked and corrections made if need.
- 6 bridges had a typo in the Legal Load 6, should be 5C1, not SC1.
- 4 bridges showed city maintenance in Item 21 but should be county (3430898, 3430235, 3432971, 343 7175)
- 3430332 and 3433218 should not have the Op Rating Factor capped at 3.00, check calculations.
- 12 bridges had the Operating Rating Factor extremely high or the Inventory Rating Factor extremely low. Check calculations.

- SFN 3433080 was the only bridge that showed code 5 in item 42A (type service on=hwy/ped) The county indicated that there should be several more with a code 5 on Item 42A. The county should locate those and change Item 42A.

- SFN 3436331 and 3430804 needs to have Item 93A – Critical Feature FC Inspection Y/N done at next inspection.

- SFN 3436331 and 3430804 needs to have Item 92B – Critical Features: Underwater Inspection Y/N done at next inspection.

- SFN 3432386 is coded as 195 but the structure is a concrete box with 1 foot of fill and should be a 171.

- There were numerous errors in the SMS load rating pages for the posted bridges, mostly in the Ohio % Legal. The county was given copies showing the problems. These should be corrected.

- SFN 3430448 was posted 20 tons but should be 11 tons. The county needs to go through all load ratings for posted bridges and look compare the load ratings to the posting signs.

- The county was given a list of bridges where Item 63 Method of Rating showed calculations (code 6) but the software used item 708 shows code 0 (none). Either the Method Used to Determine Operating Rating OR the Load Rating Software needs to be fixed. (Item 63 or Item 708)

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

- SFN 3431827 c7.2 Edge of Floor/Slab (LF) should be rated a 3. All ratings for Beams should be removed on all concrete slab structure types. Abutment Caps (LF) should not be coded. The main member Item 475 should be coded slab instead of concrete rigid frame. Guardrail survey items should be coded 0, not 1.

- SFN 3431886 Detailed comments are needed since the Summary is a 5.

- SFN 3433757 Length of Max Span Item 48 should be 16 and not 19. Structure length Item 49 should be 17 and not 22.

- SFN 3432386 Bridge type should be coded as a 171, not 195 since it has 1 foot of cover and is a concrete box..

- SFN 3430715 Comments need to be improved, such as: Cracks need to be added to the deck. The SE corner of abutment cap needs to have a 2nd spall added. Item 47 clearance on the bridge should be 22', not 11'. Sidewalks Item 50A & 50B should show 0 (there is no sidewalk). Curb Items 425-428 should show none. Item 475 Main Member should be code 6 (prestressed box beam), not code 2. Item 453 should be code 4 (elastomeric) not code 3.

- SFN 3430618 Guardrail safety items should be coded 0, not 1. Scour code should be code 5, not code 4.

Files

The county is working on their filing system. They have a new county engineer and he is setting up a better system.

Load Rating

The inventory shows 79 (100.0%) of the County bridges have been Load Rated or Load Rating was not applicable. 5 were evaluated by documented engineering judgement. The county did not have BR-100 forms for the bridges, but will be doing them. The County was also reminded that Load Factor is required for bridges built after 1993 and LRFR is required for bridges built after 2010.

Load Ratings were checked for SFNs 3431398, 3430448, 3436381, 3436500. The load posting at the bridge matched the load ratings. PE name and stamp was only on bridge SFN 3431398. Posting matched the Load Rating for only bridge SFN 3431398 and did not match for SFNS 3430448, 3436381, 3436500. All the bridges had documentation.

Load Posting

Harrison County has 12 bridges that are load posted. There is 1 bridge that closed for load capacity reasons. They use a gross tonnage and SHV sign for load posting. Posting is based on Operating Rating.

Special Features

The County has no bridge with special features.

Fracture Critical Bridges

Harrison County has 4 bridges labeled as a fracture critical bridge in the SMS. 0 bridges have gusset plates.

FC bridge SFN 3431398 file was checked. It included the FCM's. The Fatigue Prone details was shown and the procedure was written and detailed.

Gusset Plate calculations were not applicable on the sampled bridge since it was a girder.

Underwater Inspections and Scour
0 bridges need an underwater inspection. There are 0 bridges considered to be Scour Critical.

QA/QC
The QA/QC section of the 2014 Bridge Inspection Manual meets the FHWA requirement.

Critical Findings
The county does not have a Critical Findings Procedure in place. They were shown the one that is in the Inspection Manual and advised they will have to follow that one.

Bridge Maintenance
The County does force account bridge work as needed. Work performed on bridges include redecking and abutment and headwall repairs. Approximately $130,000 is budgeted for force account work annually.

The county has a contract reconstruction program in place. The approximate annual budget is $350,000. The County uses Fed Funds and Credit Bridge Funds.

Projects are identified based on general appraisals and issues noted during inspections. Plans are developed for emergency repairs generally in-house, sometimes after consultation with ODOT District 11 personnel. Emergency repairs are completed by county forces if possible. Contractors are hired if needed. All jobs are tracked by daily timesheets. The Team Leader and Program Manager (County Engineer) are able to order road closures. After making such a decision, the sheriff and highway superintendent are notified of the need to close a road.

CONCLUSIONS AND RECOMMENDATIONS

The following items should be addressed:

- They do not have BR-100 forms for all the Engineering Judgement bridges. They will do this.

- They do not have load posting documentation or a filing system. They are working on this to have this done and in place.

- SFN 3431851, 3431886, 3431177, 3430456show 150% legal but the Op RF is less than 75%. The load rating data should be checked and corrections made if need.

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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 ** 83%				
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 ** 94%				
23	Updating of Data				

** based on results of Field Review

Metric	Action Needed
12	Ratings need to be within 1 value of the Manual, increase use of comments
13	Comlete review of load ratings and postings and make corrections where needed
15	Complete filing system for bridges
22	Improve inventory, check items during inspection