National Bridge Inspection Standards & Bridge Maintenance Program Review Union County June 5, 2019

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

IN ATTENDANCE:

Jeff Stauch, PE, PS, Union County Engineer
Matt Rotar, PE
Mark Stockman PE , CEAO Federal Bridge QA/QC Engineer
Tom Messerly PE
Mike Brokaw PE, ODOT

SCOPE OF REVIEW:

The review consisted of interviews with Union County personnel, reviews of inspection and inventory data, and reviews of Union County bridge records. The office evaluation assessed Union 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 Union 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
8032300	UNI C0133 00.414 B	395	1962	13'	5A	4A
8031908	UNI C0078 00.010 A	231	1980	165'	6A	5A
8032033	UNI C0078 02.219 D	112	1977	76'	6A	same
8033757	UNI T0146 00.230 A	444	2007	165'	6A	same
8030014	UNI C0023 00.315 A	322	1983	208'	6A	same
8051054	UNI C0113 02.590 D	344	2000	92'	7A	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. Union County has 0 bridges on the expanded NHS.

At the time of the Program Review, Union County has inspection responsibilities for 320 bridges, 128 of which are longer than 20 feet in length and 192 which are 10 feet to 20 feet long. The County showed total of 321 bridges, 139 being longer than 20 feet in length and 182 being 10 feet to 20 feet in length. The county should review their records and the SMS to be sure that the two are consistent. 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 4 possible bridges had the NBIS designation Y/N coded incorrectly.

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

Union 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 10 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 Slab bridges, 2 hours to inspect Truss bridges, and 30 minutes to inspect culvert bridges.

The County has 4 bridges that require a snooper for inspection. They currently use cantilever scaffolding to inspect these 4 bridges and use the snooper to inspect every 10 years. They will probably apply for the ODOT snooper in future years.

Frequency of Inspections

Ohio State Transportation Laws require all State and local bridges to be inspected annually. Union 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 Inspection Team, inclusive of Program Manager, Reviewer, Team Leader, and Team Member, can determine if a bridge requires more than one inspection annually. To do this, they refer to the condition rating.

Qualification and Duties of Personnel

Mr. Jeff Stauch is the County Engineer, Reviewer, and Load Rating Engineer. As County Engineer, he is the final authority on the bridge inspection program. Mr. Stauch is a P.E. #055015 and a P.S. and has 30 years of inspection related experience. He took multiple Bridge Inspection Level trainings since 1987 and the Bridge Inspection Refresher in 2011. Mr. Stauch will be taking new Bridge Inspection Refresher within the year and is qualified as Reviewer.

Mr. Tom Messerly is the Program Manager and Team Leader. He has 8 years of inspection related experience. He took the Bridge Inspection Level 1 and Level 2 in 2011, the Bridge Inspection Refresher in 2012, SMS Training in 2013, and the Element Level Bridge Inspection Training in 2016. Mr. Messerly is qualified as Program Manager and Team Leader.

Mr. Matt Rotar is a Load Rating Engineer and Team Member. His PE #83795. Mr. Rotar will be taking classes within the year. Mr. Rotar is qualified as Load Rating Engineer.

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

- SFN 8032300
    - General Appraisal Rating should be changed from 5 to 4.
    - Scour Critical Rating should be changed from 8 to 5. It is stable and within footer limits.
    - **NOTE - Culvert invert paved with reinforced concrete this Spring 2019. The GA of the culvert was updated from a 5 to a 6 to reflect the rehab condition**.

- SFN 8031908
    - Deck Summary should be changed from 7 to 6.
    - Substructure item, Pier Columns/Bents (EA), should not be rated.
    - General Appraisal Rating should be changed from 6 to 5.
    - Scour Critical Rating should be changed from 8 to 5. It is stable and within footer.
    - Operator Rating Factor of 1.250 needs to be checked.since it is a nominal number
    - Inventory Rating Factor of 1.000 needs to be checked.since it is a nominal number
    - Superstructure Summary should be changed from 6 to 5.

- **NOTE – All corrections were made in the SMS**

- SFN 8032033
  - Substructure item, Pier Caps (LF), should be changed from 1 to 2.
  - Substructure Summary should be changed from 7 to 6.
  - Deck item, Floor/Slab, should be changed from 2 to 1.
  - Deck Summary should be changed from 6 to 7.
  - Superstructure Summary should be changed from 6 to 7.
  - Scour Critical Rating should be changed from 8 to 5. It is stable and within footer.
  - **NOTE – All corrections were made in the SMS**

- SFN 8030014
  - Substructure item, Abutment Caps (LF), should not be rated.
  - Deck Summary should be changed from 8 to 7.
  - Operator Rating Factor of 1.250 needs to be checked since it is a nominal figure
  - Inventory Rating Factor of 1.000 needs to be checked since it is a nominal figure.
  - Expansion Joint has listed sliding metal plate angle which is incorrect
  - Scour Critical Rating should be changed from 8 to 5. It is stable and within footer.
  - **NOTE – All corrections were made in the SMS**

- SFN 8051054
  - Deck item, Wearing Surface (SF), should be changed from 2 to 3.
  - Superstructure item, Stringers, should be changed from 1 to 2.
  - Superstructure item, Protective Coating System (LF) d should be changed from 1 to 2.
  - Superstructure Summary should be changed from 9 to 6.
  - Scour Critical Rating should be changed from 8 to 5. It is stable and within footer.
  - **NOTE – All corrections were made in the SMS**

Files

Union County maintains bridge files in the central control office in a file cabinet, on a server, or in ODOT SMS. ODOT SMS contains inspection reports, design calculations, plans, inventory forms, and photos/sketches. Some plans are kept in a flat file. Files cabinets contain inspection reports, design calculations, plans, load analysis calculations, photos and sketches, repairs and maintenance history, fracture critical files, Load posted/closed, Underwater inspections, special inspection equipment or procedures, and flood data, waterway adequacy, and channel cross sections. Score evaluation and Scour POA are not complete.

Load Rating

The inventory shows 128 (100.00%) of the County bridges have been Load Rated or Load Rating was not applicable. There were 0 bridges evaluated by documented engineering judgement currently. One bridge rated by Load and Resistance Factor will switch to Engineering Judgement due to Percent Legal being lowered in order to be posted. The County was also reminded, during the inspection, that 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 8033145, 8036829, 8032734, and 8033226. SFN 8033145 is load posted at 20 tons, under actual load rating of 26 tons. SFN 8036829 does not have correct load posting at 20 tons, actual load rating is 14. **The county reported Dec 09, 2019 that this signage for 8036829 would be corrected** SFN 8032734 and 8033226 load postings match the load ratings. P.E. name and stamp were on all load ratings.

Load Posting

Union County has 7 bridges that are load posted. This is determined by capacity analysis. There are 0 bridges that closed for condition ratings. They use gross tonnage signage. Posting is based on Operating Rating. Bridges are analyzed using Load Factor, WS or AS, or Load & Resistance Factor.

Special Features

Union County has zero bridges with special features.

Fracture Critical Bridges

Union County has 8 bridges labeled as a fracture critical bridge in the SMS. There are 14 with gusset plates.

Fracture critical files were checked for SFN 8033145 and SFN 8036829. Files did contain the identification of the fracture critical member and details of the procedure. Files do not have Fatigue Prone details due to being riveted.

Gusset plate calculations were checked for SFN 8033145 and 8036829. The P.E. name and stamp were present. The unstiffened edge test is unknown.

Underwater Inspections and Scour

There are 0 bridges that require underwater inspections. There are 9 bridges considered scour susceptible. Scour evaluations are performed by probing and visual inspections. Diving evaluation is performed if the Inspection Team discovers a critical finding based on probing results.

QA/QC

The QA/QC section of the 2014 Bridge Inspection Manual meets the FHWA requirement. In addition, inventory is checked for needed updates annually.

Inventory QA are performed during the inspection process annually. The county was reminded that the updated inventory data should be forwarded to ODOT at least once every 180 days.

Critical Findings

The county does have a Critical Findings Procedure in place. The Team Leader immediately contacts the Control Authority Program Manager, while at the bridge site, for consensus. The Control Authority Program Manager contacts the necessary public safety authorities so the immediate threats to public safety is averted. The Team Leader ensures corrective or protective measures are implemented in a timely manner to safeguard the traveling public and submits the completed inspection report to the Reviewer with Critical Finding coded with Yes

within 2-weeks of discovery. The Reviewer, using inspection software, places the bridge inspection report at the top of the review list upon submission from the Team Leader.

The County Engineer, Program Manager, Road Superintendent, and Bridge Foreman is notified when emergency repairs or critical findings are necessary and is documented using daily time sheets and work orders. Emergency bridge repairs are noted as a separate document, separate from the inspection report. The county was advised to use the SMS Critical Findings Report.

Bridge Maintenance

The County has maintenance responsibilities for 320 bridges, 128 of which are longer than 20 feet in length and 192 which are 10 feet to 20 feet long. The County does force account bridge work as needed. The work includes small bridge work and the chip seal program. Force account work uses available funding when necessary.

The county uses in-house staff to do in-house repairs, rehabilitation, and replacements for small bridge work and chip sealing. Work performed on bridges include small bridge replacement, chip seal, fog seal, roadside mowing, snow and ice removal, culvert replacement, and tree and brush removal.

The county hires contractors for large bridge replacement and rehabilitation, road widening, resurfacing, the pavement marking program, and the ditch program. Funding for contract work varies by project between federal funding, Ohio Public Works Commission grant funding, and Union County ¼ percent sales tax revenues.

Projects are identified using condition ratings, traffic count, 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 time sheets and work orders. In an emergency, the County Engineer staff are empowered to close roads. The County Sheriff is notified, who alerts other authorities, and the Team Leader is responsible for closing the road.

CONCLUSIONS AND RECOMMENDATIONS

The following items should be addressed:

1) SFN 8036829 does not have correct load posting at 20 tons, actual load rating is 14. The load posting should be lowered to 14 tons. **The county reported Dec 09, 2019 that this signage for 8036829 would be corrected**

2) Mr. Jeff Stauch needs to take a bridge refresher course within the year.

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