National Bridge Inspection Standards & Bridge Maintenance Program Review
Belmont County
June 18, 2019

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

IN ATTENDANCE:

Terry Lively, PE, PS, County Engineer
Jason Popa, PE
Mark Stockman, PE, PS, CEAO Federal Bridge QA/QC Engineer

SCOPE OF REVIEW:

The review consisted of interviews with Belmont County personnel, reviews of inspection and inventory data, and reviews of Belmont County bridge records. The office evaluation assessed Belmont 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 Belmont 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
0735949	BEL-T0276-0002	231	2009	33'	6A	same
0730629	BEL-C0005-1615	112	1974	64'	6A	same
0734020	BEL-C0005-1704	321	1991	29'	4P	same
0730645	BEL-C0005-1727	321	1960	26'	4P	same
0731234	BEL-C0066-0043	231	1939/95	53'	6A	same
0735264	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. Belmont County has 0 bridges on the expanded NHS.

Belmont County has inspection responsibilities for 276 bridges, 161 of which are longer than 20 feet in length and 115 which are 10 feet to 20 feet long. The County showed a total of 276 bridges, 165 being longer than 20 feet in length and 111 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 7 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

Belmont County uses their own staff to do the inspections. Previous inspection reports, including all notes and photos are available at site for review. The inspections are marked on a paper copy then entered in SMS in the office. Photographs are taken of all defects during the inspection. Comments, including maintenance comments, are recorded on the previous inspection report and brought to the bridge. All bridge plans are readily available for review in the bridge office. 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 10-15 inspections per day were completed in 2018. It is recommended to have an average of only 10 inspections per day. The inspections include some smaller bridges between 10'-20' as well as NBIS length bridges. For an average-sized bridge it takes 30 minutes to inspect Beam/Girder and Slab bridges, 1 hour to inspect Truss bridges, and 15 minutes to inspect culvert bridges.

Quality assurance checks are made of the inspection process for every bridge by maintaining consistent inspection procedures, having all photos available for review, reviewing each inspection a separate time after it had been entered into SMS, and reviewing the data from SMS a final time.

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. Belmont 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 Program Manager and County Engineer can determine if a bridge requires more than one inspection annually. To do this, they refer to the condition rating, deterioration, and loading conditions.

Qualification and Duties of Personnel

Mr. Terry Lively is the County Engineer and Program Manager. As County Engineer, he is the final authority on the bridge inspection program. Mr. Lively is a P.E. and P.S. and took Bridge Inspection Part 1 and 2 trainings in 2015. Mr. Lively is qualified as Program Manager. He will need to take a Refresher course in 2020.

Mr. Jason Popa is Team Leader, Reviewer, and Load Rating Engineer. Mr. Popa is a P.E. #60606 and has 24 years of inspection experience. He took the comprehensive bridge inspection course from ODOT in 1995 and the ODOT Level 2 course in 2006. He took various refreshers in 2011, 2013 and 2015. Most recently, he took the ODOT Bridge Inspection Refresher in 2017. Mr. Popa is qualified as Team Leader, Reviewer, and 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 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 0730629
  - Abutment Caps (LF) should not be rated. Remove rating of 2.
  - Pier Caps (LF) should not be rated. Remove rating of 2.
- SFN 0735949
  - Inventory Route Total Horizontal should be changed from 80 to 20.

Files

Belmont County maintains bridge files in the central control office in inspection books, in bridge files, or in ODOT SMS. ODOT SMS contains inspection reports, channel cross sections/profile photos, and critical files. Inspection books contain inspection reports, inventory, photos, and repairs. Bridge files contain load analysis calculations, load posting documentation, significant correspondence, inventory, photos, and repairs. Flood history, High water marks and photos are kept in a shoebox of the event. Score evaluation and Scour POA are not applicable.

Load Rating

The inventory shows 276 (100.00%) of the County bridges have been Load Rated or Load Rating was not applicable. There were 11 bridges evaluated by documented engineering judgement currently. 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 0734160 and 0734802. SFN 0734160 and 0734802 load postings match the load ratings and have documentation. P.E. name and stamp were on all load ratings and BR-100 forms were available for all Engineering Judgement bridges.

Load Posting

Belmont County has 20 bridges that are load posted. This is determined by capacity analysis. There is 1 bridge that is closed for reason other than capacity and 1 bridge closed for capacity reason. According to SMS, 1 bridge is not rated, but it is a bridge that does not carry vehicular traffic. It is 0733563, a wood truss used for pedestrian traffic. They use SHV signage. Posting is based on Operating Rating. Bridges are analyzed using Load Factor, Field Eval & Engineering Judgement, or Load & Resistance Factor.

Special Features

Belmont County has zero bridges with special features.

Fracture Critical Bridges

Belmont County has 10 bridges labeled as a fracture critical bridge in the SMS. There are 10 with gusset plates. All bridges requiring fracture critical inspections have been inspected in the 24-month intervals.

Fracture critical files were checked for SFN 0734160. Files did contain the identification of the fracture critical member and Fatigue Prone details. Files do not have the procedure detailed. The County was advised to do for next year.

Gusset plate calculations were checked for SFN 0734160. The P.E. name and stamp were present. The unstiffened edge test was complete.

Underwater Inspections and Scour

There are 0 bridges that require underwater inspections. There are 276 bridges considered scour susceptible. Scour evaluations are performed by probing and visual inspections. Diving evaluation is performed based on field conditions and approval from the Program Manager and County Engineer. Scour evaluation channel photos are done,

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

Belmont County has inspection responsibilities for 276 bridges, 161 of which are longer than 20 feet in length and 115 which are 10 feet to 20 feet long. The County showed a total of 276 bridges, 165 being longer than 20 feet in length and 111 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 County does force account bridge work as needed with 6 full-time employees. The work includes new decks and stringers. Force account work has a budget of $100,000 annually. Federal Funds are rarely used due to having an adequate number of full-time employees and limited time to apply for funds.

The County uses in-house staff to do in-house repairs, rehabilitation, and replacements for small bridge work. Work performed on bridges include new decks, stringers, beams, and abutment rehab. In-house repairs and replacements have a budget of $400,000 annually.

Projects are identified using inspection reports and discussion with the bridge crew supervisor. The plans for emergency repairs are developed in-house and are also performed by the Bridge Supervisor, Assistant Engineer, and County Engineer. Repair work is documented in the daily time cards. In an emergency, the County Engineer is responsible for emergency road closure but Bridge Supervisors are empowered to close roads when necessary.

CONCLUSIONS AND RECOMMENDATIONS

The following items should be addressed:

1) Watch in future for the revised definition of abutment and pier caps. A wall type foundation will not have a cap. SFN 0730629 is one example.

2) SFN 0735949 Inventory Route Total Horizontal should be changed from 80 to 20.

3) Possible NBIS Length errors need to be reviewed with County data against SMS.

4) Files do not have the procedure detailed. The County was advised to do for next year.

5) Mr. Terry Lively needs to take a bridge refresher course in 2020.

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 ** 100%				
23	Updating of Data				

** based on results of Field Review

Metric	Action Needed
16	Create detailed FC Inspection Procedure for each FC bridge