

National Bridge Inspection Standards & Bridge Maintenance Program Review

Lorain County

September 29, 2020

By: Mark Stockman, PE, PS
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IN ATTENDANCE:

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SCOPE OF REVIEW:

The review consisted of interviews with Lorain County personnel, reviews of inspection and inventory data, and reviews of Lorain County bridge records. The office evaluation assessed Lorain 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 checked during the field review were:

SFN	CTY-RTE-SECT	TYPE	County Rating	Suggested NBIS Rating
4733797	LOR-T0042-0227	Steel Pony Truss	3P	same
4734173	LOR-M0158-0044	Masonry Deck Arch	4A	same
4740602	LOR-C0062-0127	Concrete Slab	3P	same
4737520	LOR-T0159-0057	Steel Stringer	4A	same
4734092	LOR-T0121-0609	Prestressed Box Beam	4A	same
4739248	LOR-C0030-0601	Concrete Slab	4A	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/legregs/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.

Lorain County has inspection responsibilities for 232 bridges, 120 of which are longer than 20 feet in length and 112 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

Lorain County uses their own staff to do the inspections. Previous inspection reports are available at site for review. Copies of last year's inspections are taken to the field and marked up with new ratings and comments. They are then taken back to the office. Comments are recorded in the notes section of AssetWise. They are brought to the bridge. Bridge plans are not carried to the bridge site for review. Bridge plans are available on file at the Bridge Office. Photos are available for every bridge, and photos are taken of defects during inspection.

The County indicated that an 8-12 inspections per day were completed in 2020. Truss (pony/through/deck) takes 1 hour. It takes 0.75 hours for Beam/Girders. For a slab, it takes about 0.75 hours. For a Culvert, it takes about 0.5 hours.

The County has 2 bridges that they use a snooper for inspection on a 5 year frequency.

The county was reminded to perform an initial inspection when a bridge is newly opened and have a Team Leader present at all inspections.

Frequency of Inspections

Ohio State Transportation Laws require all State and local bridges to be inspected annually. Lorain County had 233 bridges inspected in 2020. The NBIS maximum inspection frequency of two years is met. All Bridges over 10 feet in length are inspected annually. The Engineer determines the need for a routine inspection frequency greater than once a year. There are not any bridges that requires inspection more frequently than one year.

The county indicated that the FC inspections were a 1-2 year frequency and the UW inspections were a 5 year frequency. They were reminded that the actual frequency is 24 months and 60 months.

LOR-T0044-0823 _(4736303) inspected in May 2019. The 2020 inspection was performed in 12/28/2020. The county was reminded that this exceeded the 18-month window allowed by the ODOT Bridge Inspection Manual.

Qualification and Duties of Personnel

Mr. Ken Carney is the County Engineer. He is a PE and as County Engineer he has overall responsibility for the bridge inspection program.

Mr. Shaun Duffula is the Program Manager and Reviewer. He is a PE and has 4 years of inspection related experience. He took Level 1 and Level 2 in 2016. The Comprehensive certificate is upload to AssetWise and is compliant with the Metric Requirement. He took a Bridge Inspection Refresher in 2019. The Refresher certificate is upload to AssetWise and is compliant with the Metric Requirement.

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.

Comments were found to be partially inadequate, more detail showing Location Extent and Severity should be used when the rating is <6. 2 bridges LOR-C0040-0024 _(4737644) and LOR-C0050-0423 _(4734882) have ratings < 6 but no comments were in AssetWise. 2 bridges LOR-M0043-0157 _(4735943) and LOR-T0008-0152 _(4734645) had a scour rating that was lower than the substructure rating and the scour should have controlled the substructure rating.

Field Review (Detailed comments in “Remarks” document)

LOR-T0042-0227 (4733797) Steel Truss

- Ratings = Good
- Defect Photos = Good
- Comments = Need LES. Also found holes in Beam 2 that were not noted in the inspection.
- Channel Photos = Good

LOR-C0030-0601 (4739248) Conc Slab

- Ratings = Good
- Defect Photos = Good
- Comments = Good
- Channel Photos = Good but also need photos of bridge from farther back

LOR-T0159-0057 (4737520) Steel Beam

- Ratings = Good
- Defect Photos = Good
- Comments = Superstructure comments need better LES, size of holes, % section loss, as highlighted below:

1. Outside beams completely rusted out, holes throughout web. (east is worse)

2. Beam 2 from west has **section loss** near forward abutment bearing. Remaining beams are in relatively good shape with little to no section loss.
3. **Section loss** in bottom flange of beams at concrete

-Channel Photos = Good – identify directions, hard to tell if there are upstream and downstream photos

LOR-M0158-0044 (4734173) Masonry Arch

- Ratings = Good
- Defect Photos = Good
- Comments = Good
- Channel Photos = Good

LOR-C0062-0127 (4740602) Conc Slab

- Ratings = Good
- Defect Photos = Good
- Comments = Good
- Channel Photos = Good

LOR-T0121-0609 (4734092) Prestressed Box Beam

- Ratings = Good
- Defect Photos = Need better photos of piling to justify the rating of 4
- Comments = Notes for Deck, Substructure, and Superstructure are required to be in AW. It's NOT OK to say contact LOR Co Engr Office. Describe size of cracks
- Channel Photos = Channel photos too close – add general elevation photos- but North elevation tight angle, try another photo showing the 70 degree angle.

Inventory Items

During the Files review, there were 5 bridges that were culverts but had a deck rating, which is an error. 2 Non-NBIS bridges were missing the Operating Rating Factor. These errors were corrected by the county. The county was reminded that they have 180 days to input inventory data on new bridges and any updated inventory data.

Files

Lorain County keeps all information and documents as follows. Inspection reports, including old inspections, are kept electronically and in hard files. Design Calculations, Load Analysis Calculations, Repair History, Scour Evaluations, and Fracture Critical Files, are all kept in the bridge file in the office. Plans, Inventory, Photos are kept electronically on the computer.

Load Rating

The inventory shows 120 (100.00%) of the County NBIS bridges have been Load Rated or Load Rating was not applicable. (6 bridges do not have vehicular traffic or are closed) There were 4 bridges evaluated by documented engineering judgement.

Load Ratings were checked for SFNs 4737156, 4738802, 4733797, and 4739469. The load posting at the bridge matched the load rating on all bridges. P.E. name and stamp were on all

of the bridges. Documentation was on all of the bridges. However, the BR100 for 4739469 was done incorrectly. The Method of Rating for engineering judgment bridge was code D, and it should have been code 0. The county was advised to make the corrections.

The county was reminded to round of Item 734 % Legal to the nearest 5 tons, and one bridge was coded as 29%. Also 4737380 was under 14' of fill and should be coded as under deep fill, with Method of Rating = D per the Section 900 exemption listed in the Manual Appendix H.

The county was also reminded that a review of the load rating is required every time the GA drops one level, beginning at GA=5, (5-4, 4-3, 3-2, etc.) A note showing the review date should be put in the load rating narrative.

Load Posting

Lorain County has 15 bridges that are posted. There are 2 bridges closed for capacity reasons. They use a mix of engineering judgment and analysis. The large load limit sign R12-H5 is the type of sign used for load posting.

Special Features

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

Fracture Critical Bridges

Lorain County had FC Plans for SFN 4738527 and SFN 4735283 reviewed. They both had FCM's identified. However, neither one showed the Fatigue Prone details and the procedure was only partially complete. Risk Factors are incomplete. Risk factors are listed in the Metric 16 and include low temp, load limits, rating 4 or less listed when it applies to that bridge. There also needs to be better description of inspection methods. The county was advised to use The Inspection Manual Appendix D & E as a guide.

Gusset Plate calculations for 4735293 were good. However, it was noted that the calculations contained locations that failed the minimum edge stiffness test. This was explained to the county and they were advised that the inspector needs to be aware of these locations to be sure they are closely watched, or the county can weld additional steel to the gusset plates so the test would pass.

Underwater Inspections and Scour

There is 1 bridge E 31st St #0069 (4735072) requiring underwater inspections. There are 0 bridges that are scour critical. This bridge used the UW checklist as the UW inspection procedure and is compliant with Metric 17. However, the UW inspection report for this bridge had some conflicting data regarding the flowline being below the top of the footer. This was discussed with the county and they were advised to follow up with the consultant for clarification.

QA/QC

The QA/QC section of the 2014 Bridge Inspection Manual meets the FHWA requirement. Quality Assurance checks are performed by updating the inventory as changes are made in bridge status or as they are found. Inventory is looked over as needed. Updated inventory data needs to be forwarded to ODOT within 180 days. The inventory data is updated through Asset

Wise. Changes are discovered during inspection when new inspection is being input. It is then forwarded to ODOT immediately during inspection and on new construction, as soon as the project is complete or the bridge is ready to open.

Critical Findings

The county does have a Critical Findings Procedure in place located in the AssetWise. When emergency repairs or critical findings are necessary, the inspectors notify the Engineer, Assistant County Engineer and Road Superintendent. The emergency action is documented in AssetWise using the Critical Findings report. If a bridge requires emergency repairs, it would be noted on the field inspection comments. The inspector verifies that the correct limits are on load limit signs at the bridges.

Bridge Maintenance

The county notes maintenance issues during the inspection, and a yearly list of work orders is sent to the bridge crew.

The County does force account bridge work as needed. The work includes Superstructure replacements, cleaning channels, scour protection, deck repairs/replacements. The budget varies as needed. The county uses in-house crews of 3-8, as needed for the job.

The county has a contract construction program for full replacements and superstructure replacements. They typically replace 2-4 bridges per year using local and OPWC funds, and more in the LBR program. The county does use federal funds and credit bridge funds for replacements

Projects are identified and selected based on inspections and load rating. County forces are the ones who do the emergency repairs for most repairs. When there are emergency road closures, the inspector, road superintendent, and engineer are empowered to order emergency road closures. The sign shop is notified to place barriers and local authorities are contacted.

Metric Review

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	(CC)	Conditionally Compliant
(SC)	Substantially 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

5	Obtain Dive inspector qualification. Ensure meets comprehensive and refresher
6	perform Routine inspections within 18 months of previous insp
12	Supply comments when ratings < 6 for Deck, Channel, Superstr, Substr, and Culvert
14	Check if should be in tons
16	Supply FC Insp Procedure, FCM ID, and Fatigue Prone Details for each FC bridge

Note: Bridge file needs to have the dive insp credentials in the file.