National Bridge Inspection Standards &
Bridge Maintenance Program Review
Hardin County
July 12, 2021

(November Data update)
By: Mark Sherman, PE
CEAO Federal Bridge QA/QC Engineer

IN ATTENDANCE:

Luke Underwood, Hardin County Engineer
Mark Sherman, CEAO Federal Bridge QA/QC Engineer
Brad Early, Hardin County

SCOPE OF REVIEW:

The review consisted of interviews with Hardin County personnel, reviews of inspection and inventory data, and reviews of Hardin County bridge records. The office evaluation assessed Hardin County's organization, procedures, resources, and documentation regarding the inspection, inventory, and maintenance operations for bridges. In addition, field reviews of **8** 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 Hardin County to represent a variety of structure types and conditions. The bridges checked during the field review were:

Asset Name	Bridge Type	County Rating	NBIS Rating
HAR-T0190-1600 _(3346455)	Concrete Culvert Twin pipes	4	Agreed
HAR-C0155-0525 _(3345688)	Concrete Arch	4	Agreed
HAR-C0190-1300 _(3348547)	Steel Beam	4	Agreed
HAR-C0065-0075 _(3330710)	Prestressed Box Beams	4	Agreed
HAR-C0065-0110 _(3330664)	Concrete Tee Beam	4	Agreed
HAR-C0150-0340 _(3332268)	Steel Pony Truss	5	Agreed
HAR-T0055-1740 _(3350010)	Concrete Girder and Floor beams	4	Agreed
HAR-C0075-1800 _(3337006)	Prestressed Box Beams	4	Agreed

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.

Hardin County has inspection responsibilities for **358** bridges, **237** of which are longer than 20 feet in length and **121** 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:

Hardin County uses their own staff to do the inspections. Previous inspection reports are available at site for review. The previous year's inspection reports are on paper and transferred to AssetWise in the office. Bridge comments are recorded in the inspection form.
Bridge plans are available in the office. Photos are available for every bridge, and photos are taken (if needed) of defects during inspection and posted in Assetwise.
The County has **22** bridges that require a snooper, only **4** have had a snooper inspection.
A Team Leader is present at routine inspections.

Frequency of Inspections (metric 6 & 7)

Ohio State Transportation Laws require all State and local bridges to be inspected annually.
Hardin County had **358** 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, based on inspections and history.
There are no bridges that require inspection more frequently than one year.
Hardin County had **0** bridges overdue for Fracture Critical inspection at the time of this field review.

Qualification and Duties of Personnel (metric 1 & 2)

Program Manager: & Reviewer:

Lucas J. Underwood PE, PS Hardin County Engineer

List qualifications/yrs. Experience.

Engineer for county for 17 years. Private industry for 4 years.

List courses attended (& approx dates).
Bridge Inspection Level 1 & 2 (March, April 2010), Element Level Bridge Inspection (May 2016),
Bridge Inspection Refresher Training Modules 1-7 (March 18 – April 7, 2021).

Team Leader:
Douglas (Brad) Ealy
List qualifications/yrs. experience (bridge inspection experience)
Associate Degree – Mechanical Engineering Technology w/Structural Design Option.
30 yrs. experience

ODOT 6 Hour Bridge Refresher Training 1/14/2020

Element Level Bridge Inspection Training. 5/10/2016

SMS Training (9 hours). 3/26 & 27/2013

ODOT Manual of Bridge Inspection Update. 3/1/2011

ODOT Level 2 Bridge Inspection. 4/15-17/2009

ODOT Level 1 Bridge Inspection. 3/18-20/2009

ODOT 24 Hour Bridge Inspection Course. 6/1-3/1998

ODOT 24 Hour Bridge Inspection Course. 2/25-27/1997

ODOT 24 Hour Bridge Inspection Course. 4/4-6/1995

ODOT 24 Hour Bridge Inspection Course. 4/27-29/1993

ODOT 24 Hour Bridge Inspection Course. 4/16-18/1991

Load rating Engineer:
Lucas J. Underwood PE, PS Hardin County Engineer

Underwater Bridge inspector: NA

Inspection Reports (metric 12)
As part of this review, eight bridges were field reviewed to compare conditions with the most recent inspection report. The individual condition ratings for all of the field sampled 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.

Field Review:

HAR-T0190-1600 _(3346455) Twin Concrete pipe Culverts
Item 58 Deck…….. N
Item 59 Superstructure……N
Item 60 Substructure…….N

Item 61 Channel……..6 Agreed
Item 61.01 Scour……7 Agreed
Item 62 Culvert……..4 Agreed
Item 36 Railing…….. 0 0 0 0
Item 72 Approach Alignment …….. 8 Agreed
Comments: Great Comments
Defect Photos: Photos not in Assetwise, but office files contain good photos
Channel Photos: One photo in Assetwise under General Elevation (again Office Files have complete set of photos

HAR-C0155-0525 _(3345688) Concrete Arch
Item 58 Deck…….. N Agreed
Item 59 Superstructure……4 Agreed
Item 60 Substructure…….5 Agreed
Item 61 Channel……..4 Agreed
Item 61.01 Scour……5 Agreed
Item 62 Culvert……N
Item 36 Railing…….. 0 0 0 0 (not up to current Standards)
Item 72 Approach Alignment …….. 8 Agreed
Comments: Excellent Comments
Defect Photos: Although comments and notes are great, a couple of photos in Assetwise would be good. By reference, there are many photos on file.
Channel Photos: One acceptable Channel Photo in Assetwise, with many in bridge files.

HAR-C0190-1300 _(3348547) Steel Beams
Item 58 Deck…….. 4 Agreed
Item 59 Superstructure……4 Agreed
Item 60 Substructure…….7 Agreed
Item 61 Channel……..4 Agreed
Item 61.01 Scour……7 Agreed
Item 62 Culvert……N
Item 36 Railing…….. 0 0 0 0
Item 72 Approach Alignment …….. 8
Comments: Very Good Comments
Defect Photos: Very good Defect Photos
Channel Photos: One acceptable Channel Photo in Assetwise, with many in bridge files.

HAR-C0065-0075 _(3330710) Prestressed Box Beams
Item 58 Deck…….. 4 Agreed
Item 59 Superstructure……4 Agreed
Item 60 Substructure…….5 Agreed
Item 61 Channel……..5 Agreed
Item 61.01 Scour……7 Agreed
Item 62 Culvert……N
Item 36 Railing …….. 0 0 0 0
Item 72 Approach Alignment …….. 7 Agreed
Comments: Excellent Comments
Defect Photos: Defect Photos in office bridge file
Channel Photos: One acceptable Channel Photo in Assetwise, with many in bridge files

HAR-C0065-0110 _(3330664) Concrete Tee Beam

Item 58 Deck……..4 Agreed

Item 59 Superstructure……4 I would rate this a 3, due to the rebar exposure and indeterminant bond strength of concrete to rebar and that no load rating has been performed in 10 years. but the 4 is within the tolerance range.

Item 60 Substructure…….6 Agreed

Item 61 Channel……..5 Agreed

Item 61.01 Scour……..7 Agreed

Item 62 Culvert……N Agreed

Item 36 Railing…… 0 0 0 0

Item 72 Approach Alignment …….. 8 Agreed

Comments: Excellent Comments

Defect Photos: No photos in Assetwise but representative bridge file submitted for review had complete photos. **Last Load rerated nearly 10 years ago, should be re-rated given its current condition.**

Channel Photos: See above comment

HAR-C0150-0340 _(3332268) Steel Pony Truss

Item 58 Deck…….. 4 Agreed

Item 59 Superstructure……5 Agreed

Item 60 Substructure…….8 Agreed

Item 61 Channel……..6 Agreed

Item 61.01 Scour……..8 Agreed

Item 62 Culvert……N Agreed

Item 36 Railing…….. 0 0 0 0

Item 72 Approach Alignment …….. 2 (2 seems very harsh, the manual criteria would have this a 5)

Comments: Great Comments

Defect Photos: Very good Defect Photos in files, need some in Assetwise.

Channel Photos: See previous remarks

HAR-T0055-1740 _(3350010) Concrete through Girder

Item 58 Deck…….. 4 Agreed

Item 59 Superstructure……4 Agreed

Item 60 Substructure…….5 Agreed

Item 61 Channel……..6 Agreed

Item 61.01 Scour……..5 Agreed

Item 62 Culvert……N

Item 36 Railing…….. 0 0 0 0

Item 72 Approach Alignment …….. 7 Agreed

Comments: Very good Comments

Defect Photos: Very good Defect Photos

Channel Photos: Very Good (Photos)

HAR-C0075-1800 _(3337006) Prestressed Box beams

Item 58 Deck…….. 4 Agreed

Item 59 Superstructure……4 Agreed

Item 60 Substructure…….6 Agreed

Item 61 Channel……..7 Agreed

Item 61.01 Scour……..6 This item should be a 5 because piling is exposed.

Item 62 Culvert……N

Item 36 Railing…..…….. 0 0 0 0
Item 72 Approach Alignment …….. 8 Agreed
Comments: Very good Comments
Defect Photos: Could use some defect photos of abutments and pier caps
Channel Photos: See previous remarks

Review of the bridge data showed **7** out of **229** bridges were missing comments in only the scour item 61.01 when the rating was <=5, however there were good scour comments in the channel and substructure items for these bridges. The review of the **8** bridges in the field showed **consistently excellent comments. Defect photos and Channel photos were lacking in Assetwise, but available in office files.** This requirement became effective Nov of 2020.

Bridge Files: (metric 15)

Hardin County keeps files listed below as follows:

KEY: 1=AssetWise, 2=ODOT SMS(inspections prior to 2020), 3=Filing cabinet in inspectors office, 4=Office computers, 5=Field notebook, 6=Flat files – office.

- Inspection reports, including old inspections 1,2
- Design Calculations 4
- Plans 4,6
- Load analysis calculations 3,4
- Inventory forms 1
- Photos and sketches photos - 4, sketches - 5
- Repairs and maintenance history 4 (constituent log program)
- Scour evaluation None
- Scour POA None
- Fracture Critical File 4
- Load Posting/Closing 4, 3 (card file cabinet in inspector's office)
- Underwater inspections N/A
- Special inspection eqpt. or procedures
- Flood data, waterway adequacy, channel cross sections 4

Load Rating (metric 13)

The inventory shows 233 (100.00%) of the County NBIS bridges have been Load Rated or Load Rating was not applicable. There are 17 NBIS bridges evaluated by documented engineering judgement using the BR100 form.
Load Ratings were checked for **SFNs 3330796; 3339637; 3345513.** 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. BR100 form is available for all engineering judgment bridges.
Four NBIS bridges **SFNs 3333760; 3334457; 3349799** have not been load rated.

Load Posting (metric 14)

Hardin County has **10** NBIS bridges that are load posted. There are **3** bridges closed for condition ratings. Posting is based on Operating Rating. R12-H5 signs are the type of sign used for load posting.

Special Features: There are 0 bridges with unique or special features.

Fracture Critical Bridges (metric 16)
Hardin County has 26 FC Truss bridges and 4 non truss bridges. The FC bridge inspection frequency is 12 months, done with routine annual inspections.
FC plans for **SFN 3346935; 3330796; 3345513; 3346935** were reviewed and the FCM's identified.
Gusset Plate calculations were satisfactory for both **SFNs 3346935; 3330796**

Underwater Inspections and Scour: NA

QA/QC
The QA/QC section of the 2014 Bridge Inspection Manual meets the FHWA requirement. The Inventory items are checked and updated during annual inspections.

Critical Findings (metric 21)
The county currently does not have any critical findings, but does have a Critical Findings Procedure in place (using the ODOT inspection manual). The county engineer is the bridge inspector and develops the plans for emergency work.

Inspection Comments: The inspection comments were very specific and clear containing the L E S components as well as detailed defect photos with field paint markings.

Channel Photos: Every bridge had at least one good channel photo. We need to get good photos from up stream and Downstream for every bridge. Something to work on this winter

Bridge Maintenance (From Questionnaire)

The County does contract bridge work. The typical work is for large bridges, replacements and repairs. Fed Funds are sometimes used for bridge deck replacement and Credit Bridge Funds are used for bridge replacements. The annual budget varies from year to year but averages **$300,000.00** for Contract work.

The county does force account bridge work and uses highway maintenance crews as needed.
Typical work items include all repairs and medium replacements. The annual budget for force account work is approximately **$700,000.00.**

The chart below is a review of the 23 Metrics used to measure NBIS compliance and the chart represent 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

PRELIMINARY FHWA 23 Metric Matrix

23 metrics used by FHWA to measure NBIS compliance

Compliance Codes for the following Metrics:

(C)	Compliant
(SC)	Substantially Compliant
(CC)	Conditionally Compliant (Adhering to approved PCA)
(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

Action Items for Hardin County:

Metric 13/14: HAR-C0065-0110 (3330664) **needs to be load rated again based on condition.**

County needs to improve channel photos to capture both abutments relative to channel looking at bridge from upstream and down.