National Bridge Inspection Standards &
Bridge Maintenance Program Review
Miami County
April 27, 2021

(Data update Oct 21)

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

IN ATTENDANCE:

Brit Havenar, Deputy County Engineer
Lewis McClelland, County Bridge Inspector
Mark Sherman, CEAO Federal Bridge QA/QC Engineer
Mark Stockman, CEAO Federal Bridge QA/QC Engineer
Jared Backs, ODOT
Alexis Bogen, FHWA

SCOPE OF REVIEW:

The review consisted of interviews with Miami County personnel, reviews of inspection and inventory data, and reviews of Miami County bridge records. The office evaluation assessed Miami County's organization, procedures, resources, and documentation regarding the inspection, inventory, and maintenance operations for bridges. In addition, field reviews of 6 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 Miami 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
MIA-T0076-0167 _(5533260)	Steel Truss	5	Agreed
MIA-T0262-0015 _(5537029)	Timber Truss	5	Agreed
MIA-C0021-0036 _(5531136)	Steel Beam	5	We rated it a 4 but ok
MIA-C0021-0116 _(5531144)	Prestressed Box beams	5	Agreed
MIA-C0023-0011 _(5531284)	Steel Girder w/floor beams	5	Agreed
MIA-C0017-0733 _(5530946)	Concrete Slab	5	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.

Miami County has inspection responsibilities for **338** bridges, **211** of which are longer than 20 feet in length and **127** 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:

Miami 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 **0** bridges that require a snooper.
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.

Miami County had **338** 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.
Miami County had **5** bridges overdue for Fracture Critical inspection at the time of this review.

Qualification and Duties of Personnel (metric 2)

Program Manager:

. Name of individual who is the **Program Manager and Reviewer** (makes FINAL DECISION). List qualifications/yrs. experience (bridge inspection experience)

(Metric 1&2)

- **Name:** Britt R Havenar PE PS _____
- **Yrs. Inspection related experience:** _23 years___
- **List courses attended (& approx dates)** _____

Basic Bridge inspection 1998
Advanced Bridge inspection 1999
Culvert Inspection class 2004
Load Rating classes for BARS/ LRFR/BRASSand hand Calcs. 2008
Refresher- 2011
Bridge Refresher 2020

Load Rating Engineer – Name of individual responsible for load ratings (must be PE) **(Metric 4)**

Britt Havenar OHIO PE# 65495

Team Leader:
Name: Lewis McClellen PS
Yrs Experience; 22 years
List Courses attended:

Basic Bridge Inspection -1998
Adv. Br Insp. 1999
Scour Assessment: 2008
Load rating courses 2008-2009
Culvert Inspection 2004
ODOT Bridge Insp. manual 2011
ODOT Refresher Class 2021 LTAP Update 2021

Team Leader:
Name: Daniel E Baker PE
Yrs Experience; 17 years
List Courses attended:

Basic Bridge Inspection Level 1 2004
Basic Bridge Inspection Level 2 2006
ODOT Bridge Insp. manual 2011
ODOT Refresher Class 2017 & 2021
LTAP Update 2021

Team Leader:
Name: Sam Philpot
Yrs Experience; 4 years
List Courses attended:

Basic Bridge Inspection Level 1 2017
Basic Bridge Inspection Level 2 2017
ODOT Bridge Refresher class -2021

Team Member Marilyn Hemsworth
Yrs. Exp: 1 year
Courses: BS in Civil Engineering

Underwater Bridge inspector: NA

Inspection Reports (metric 12)

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 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:

MIA-T0076-0167 _(5533260) Steel Truss

Item 58 Deck…… 6 Agreed
Item 59 Superstructure……5 After reviewing the manual, given the wide spread section loss in the stringers and slight rotation of the Floor beams, we rated the Super a 4. However you are within the one point allowance.
Item 60 Substructure…….5 Agreed
Item 61 Channel……..7 Agreed
Item 61.01 Scour……..7 Agreed
Item 62 Culvert……N
Item 36 Railing…….. ~~1~~ 0 0 0 0 Agreed Nothing up to standard
Item 72 Approach Alignment …….. 4 Agreed

Comments: The review team found the summary comments lacking in completeness, as there was no complete description for Location, Extent, or Severity.
Defect Photos: none
Channel Photos: Could be greatly improved on the downstream side.

MIA-C0021-0116 _(5531144) Prestressed Box Beam

Item 58 Deck…… 6 Agreed
Item 59 Superstructure……6 Agreed
Item 60 Substructure…….**5** The review team found the section loss in the upstream piling noted in the comments. We also found the section loss approaching 30% with damaged flange due to impact. "Section loss is seriously affecting the load path, local failures are possible (ex. Extensive perforations or loss through member, perforations through many members, buckle in compression zone)" One could argue that the pier bent is redundant with 4 piles, but only 4 piles at the spacing provided with the pier cap as deteriorated as it is, brings into question its capacity for proper load distribution. We all rated this pier a **3** for the reasons stated above. Serious consideration should be given to reinforcing this pile very soon.
Item 61 Channel……..6 Agreed
Item 61.01 Scour……..7 Agreed
Item 62 Culvert……N
Item 36 Railing…….. 1 0 1 1 Agreed
Item 72 Approach Alignment …….. 8 Agreed
Comments: Minimal Comments
Defect Photos: Could not find any in Assetwise

Channel Photos: Channel photos do not show enough of both abutments relative to the channel.

Channel Photos: Supplied Below

Channel photo could have better visibility of abutments. Fortunately the channel is narrow enough here to see the abutments are set well back from the channel.

Channel Photo is not acceptable, due to sharp angle. Cannot see channel relative to abutment on the right, or the channel immediately upstream of the bridge.

MIA-T0262-0015 _(5537029) Covered Bridge

Item 58 Deck…… 8 Agreed
Item 59 Superstructure……**5** Agreed
Item 60 Substructure……7 Agreed
Item 61 Channel……7 Agreed
Item 61.01 Scour……7 Agreed
Item 62 Culvert……N
Item 36 Railing…… 0 0 0 0 Agreed
Item 72 Approach Alignment …… 4 Agreed
Comments: simple and brief Comments
Defect Photos: limited
Channel Photos: needs improvement, like taking photos from the bridge immediately up stream.

MIA-C0021-0036 _(5531136) Steel Beams

Item 58 Deck…… 4 Agreed
Item 59 Superstructure……5 Agreed (fast approaching a 4)
Item 60 Substructure……6 Loss of section on pier cap too extensive exposing the bearing support channel. We rated this a 5, but you are within the 1pt tolerance.
Item 61 Channel……6 Agreed
Item 61.01 Scour……7 Agreed
Item 62 Culvert……N
Item 36 Railing …… 1 0 1 1 Agreed
Item 72 Approach Alignment …… 8 Agreed
Comments: Comments on inspection report are good. We observed about 80% and is the reason for the difference in rating of the substructure.
Defect Photos: See previous remarks
Channel Photos: Acceptable Channel Photos

MIA-C0023-0011 _(5531284) Steel Girder

Item 58 Deck……..8 Agreed
Item 59 Superstructure……6 Agreed
Item 60 Substructure……5 Agreed
Item 61 Channel……..6 Agreed
Item 61.01 Scour……7 Agreed
Item 62 Culvert……N
Item 36 Railing…… 0 0 0 0 Agreed
Item 72 Approach Alignment …….. 5 Agreed
Comments: Could use better comments on the substructure condition. "Spalling at SE corner" need LES
Defect Photos: No Defect Photos
Channel Photos: Need to see both abutments. May need to take multiple shots to capture what is needed.

MIA-C0017-0733 _(5530946) Concrete Slab

Item 58 Deck…….. 7 Agreed
Item 59 Superstructure……5 Agreed
Item 60 Substructure……5 Agreed
Item 61 Channel……..5 Agreed
Item 61.01 Scour……6 a quick review of the manual yielded a 5 rating sue to footing exposure length and depth.
Item 62 Culvert……N
Item 36 Railing…….. ~~1~~ 0 0 0 0 Should all be 0s
Item 72 Approach Alignment …….. 8 Agreed
Comments: Comments on inspection report very limited and brief.
Defect Photos: Would like to see more defect Photos in Assetwise.
Channel Photos: Need to improve on these. Channel measurements may work better to this size bridge and location.

Inventory Items:

Review of the bridge data showed **19** out of **209** bridges were missing comments when the rating was <=5. This requirement became effective Nov of 2020. See Snapshot files TABs for bridges in question. **4** bridges should have Scour governing the substructure rating. SFNs: MIA-C0166-0425 _(5535360); MIA-C0136-0077 _(5534615); MIA-C0111-0005 _(5534100); MIA-C0015-0452 _(5537258). And **that last bridge** has a disparity of 2 or more change in points for scour.

Files: Miami County keeps files listed below as follows:

- Inspection reports, including old inspections In Office & Garage Storage
- Design Calculations Office Bridge Files
- Plans Flat in Office
- Load analysis calculations In Office
- Inventory forms in Office
- Photos and sketches Computer and bridge folders
- Repairs and maintenance history bridge folders
- Scour evaluation inventories in office
- Scour POA NA
- Fracture Critical File Bridge file

Note the NBIS Retention period: BR-86 report 10 years, All records 3 years after bridge removed, Load rating calculations 3 years after a new rating is done.

Load Rating (metric 13)

The inventory shows 139 (100.00%) of the County NBIS bridges have been Load Rated or Load Rating was not applicable.

Load Ratings were checked for **SFNs 5536308 & 5533930.** 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.

4 total NBIS bridges were not load rated. **2** con-spans and **2** without plans

Load Rating Data

Load Rating Tab		# OF ERRORS
Col. AN	Op RF greater than Inv RF?	0
Col. AO	Posting and % Legal OK?	8
Col. AP	"0" used instead of blank	0
Col. AT	% legal <> lowest RF	39
Col. AV	Item 70 correct?	1
Col. AW	Method of Rating Alike?	0
Col. AX	Op & Inv RF in Tons as req'd?	0
Col. AY	Item 575 correct?	0
Col. AZ	Depth of fill completed?	0

The 8 bridges below have a coding of A or P in column S, but does not match the Legal % in Column T See Load rating TAB
MIA-C0025-0182 _(5531470); MIA-C0166-0262 _(5535344); MIA-T0101-0014 _(5533910); MIA-T0200-0076 _(5536219)
MIA-00047-0128 _(5532612); MIA-00065-0045 _(5532981); MIA-00066-0124 _(5533023); MIA-C0021-0036 _(5531136)

See Column AT errors
MIA-00047-0128 _(5532612) This structure has multiple errors, see Load Rating TAB

21 bridges less tha 100% legal are lacking Date for posting sign installed in the field. See Load Rating TAB

From Snapshot file.

Load Posting (metric 14)

Miami County has **9** NBIS bridges that are load posted. There are **0** bridges closed for condition ratings. Posting is based on Operating Rating. R12-H5 signs are the type of sign used for load posting.

METRIC 14 - Posting	Load rating data tab			
From Files review	**# errors**	**#sampled**	**% PASS**	**COMPLIANCE**
Op RF < 3 tons but not closed	0	211	100.0%	(C)
Op RF = 0 but not closed	0	211	100.0%	(C)
% Legal < 100 but not posted	0	211	100.0%	(C)
Item 41 = B	0	211	100.0%	(C)

From Snapshot file

The County has **21** bridges that that are coded P posted in Assetwise, but **no** posting date entered in Assetwise for sign installation.
There are **10** bridges where the % legal (Item 41) does not match the Posting code A or P (Item 734 See Column S & T in the Load Rating TAB
There are **0** bridges rated **3** or less that are not closed.

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

Fracture Critical Bridges (Metric 16) (19 bridges are Fracture Critical)

The FC bridge inspection frequency is 12 months, done with routine annual inspections.
FC plans for **SFN XXXXXXX**, was reviewed. The following 5 FC bridges are overdue for inspection.
MIA-00009-1574 _(5530415); MIA-C0023-0274 _(5531306); MIA-C0113-0057 _(5534178); MIA-C0023-0011 _(5531284); MIA-T0200-0076 _(5536219)

METRIC 16 - Fracture Critical Inspection	(from files examination)			
From Files review	Missing	# FC	% PASS	COMPLIANCE
Fract Critical Member ID	2	2	0.0%	(NC)
Fatigue Prone Detail	2	2	0.0%	(NC)
Gusset Plate Calculations	2	2	0.0%	(NC)
FC Inspection Procedure	2	2	0.0%	(NC)

From Snapshot file

Underwater Inspections and Scour: 0

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.

Routine Inspection Frequency: There were too many bridges that were past due for inspection.

METRIC 6 Insp. Frequency Routine					
Bridge Inspections Overdue			Overdue	% PASS	COMPLIANCE
Data Tab	NBIS -	24 months	0	100.0%	(C)
Col. Y	ORC -	Calendar Year	0	100.0%	(C)
	BIM -	18 months	185	12.3%	(NC)

From Snapshot files See Data TAB

Inspection Comments: All of the sample bridges had minimal comments.

Channel Photos: The bridges samples in the review had a mixed bag of channel photos, some were good and others need improvement.

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 **$1,000,000** 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 **$1,000,000.**

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

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

Action Items for Miami County:

Metric 16 Supply FC Insp Procedure for each FC bridge (I did not see one in the office files sent over)
Supply 2 FC member identification & calculations the FC bridge including Gusset Plate Calculations.

Metric 6 Too many bridge over due for inspection.