National Bridge Inspection Standards &
Bridge Maintenance Program Review
Marion County
May 4, 2021

(October data update)

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

IN ATTENDANCE:

Mark Sherman
Mark Stockman
Charlie Walker
Brad Irons
Alexis Bogen
Mike Brokaw
Kenny Tong

SCOPE OF REVIEW:

The review consisted of interviews with Marion County personnel, reviews of inspection and inventory data, and reviews of Marion County bridge records. The office evaluation assessed Marion 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 Mark Sherman to represent a variety of structure types and conditions. The bridges checked during the field review were:

Asset Name	Bridge Type	County Rating	Suggested NBIS Rating
MAR-T212A-0024 _(5133246)	Concrete Cont. Slab	4	same
MAR-C026K-1222 _(5134331)	Prestressed Box Beam	5	same
MAR-T028-0445 _D (5130611)	Concrete Tee-beam	5	same
MAR-T060A-0007 _(5135656)	Corrugated Steel Culvert	5	same
MAR-T040A-0013 _(5131006)	Steel Beam	5	same
MAR-T055B-0223_(5131219)	Steel truss	5	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.

Marion County has inspection responsibilities for **258** bridges, **145** of which are longer than 20 feet in length and **113** 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:

Marion County uses their own staff to do the inspections. Previous inspection reports are available at site for review. The previous year's inspection reports on Android Tablets 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.
4 bridges were lacking comments for items rated less than or equal to 5. See Comments TAB in /Snapshot file
MAR-C025A-0036 _(5130301) MAR-C026X-2678 _(5130492)
MAR-T040A-0013 _(5131006) MAR-T137B-0159 _(5137217)

Frequency of Inspections (Metric 6 & 7)

Ohio State Transportation Laws require all State and local bridges to be inspected annually.
Marion County had **258** 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 **0** bridges that require inspection more frequently than one year.
Marion County had **7** bridges overdue for Fracture Critical inspection at the time of this field review.

Qualification and Duties of Personnel (metric 1 & 2)

Name of individual who is the **Program Manager and Reviewer** (makes FINAL DECISION). List qualifications/yrs. experience (bridge inspection experience)
- Name: _Brad Irons, P.E., P.S._____
- Yrs. Inspection related experience: __17_____
- List courses attended (& approx dates)
_ODOT Level 1 Basic 3-day (04-07-1987),
ODOT Level 2 Advanced 3-day (04-18-1989),
ODOT Level 2 Advanced 3-day (05-07-1991),
ODOT Level 2 Advanced 3-day (04-04-1995),
ODOT Refresher (06-18-2019), OTHER (08-22-1990)

3. **Team Leader** - individual in charge of bridge inspection team (INSPECTED BY). List qualifications/yrs. experience (bridge inspection experience)
(Metric 1&3)
- Name: ___Jim Baughman_____

- Yrs. Inspection related experience: ___32_____
- List courses attended (& approx dates)
ODOT Bridge Insp. Training Course (4/6/1995),
Bridge Inspection Refresher Training (12/7/2011),
Bridge Inspection Refresher Training (8/9/2017)

__25_ Bridge/Culvert inspection
__10_ Bridge Design/Plan prep
__25_ Bridge Construction
__10_ Bridge Maintenance
__0__ Overload/Superload

- Name: ___Charlie Walker, E.I., S.I. _____
- Yrs. Inspection related experience: _5 years inspection, AssetWise Manager___
- List courses attended (& approx dates)
Bridge Insp. Level 1 Course (6/11/2014),
Bridge Insp. Level 2 Course (7/17/2014),
Culvert Inventory and Inspection Training (8/6/2015),
Bridge Inspection Refresher Training (8/9/2017) and Online December 2020

- Indicate the percentage of time spent on the listed duties in the previous year
%TIME
__10_ Bridge/Culvert inspection
__25_ Bridge Design/Plan prep
__15_ Bridge Construction
__10_ Bridge Maintenance
__5__ Overload/Superload
__20_ Surveying
__15_ Other -
_____100%

Load Rating Engineer: Brad Irons; List Ohio PE # ___*56378*___

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:

MAR-T212A-0024 (5133246) Concrete Slab

Item 58 Deck……..6 In a slab bridge the super and deck are one in the same, so the Deck and Super ratings need to match. This should be a **4**.

Item 59 Superstructure…… 4 While you have a comment, it is incomplete. You will need to state more than 50% of slab spalled. You should also state where and how severe the spalling is. Remember the Location Extent and Severity need to be included in your comments.

Item 60 Substructure……..6 We concur with this rating.
Item 61 Channel……8 We concur with this rating.
Item 61.01 Scour……6 We concur with this rating.

Item 62 Culvert……N
Railing……. 1 0 0 0 Railing on bridge is not up to standard, should be 0
Item 72 Approach…… 8 We concur with this rating.
Comments: See Comment above concerning need for Loc. Ext. & Sev.
Defect Photos: Need photo of deteriorated area to back up rating and comments
Channel Photos: Could not find Channel Photos

MAR-C026K-1222 _(5134331) Prestressed Box Beam

Item 58 Deck……..8 We concur with this rating.
Item 59 Superstructure……5 We concur with this rating. Need comments that are more specific. L E S
Item 60 Substructure…….8 We concur with this rating.
Item 61 Channel……6 We concur with this rating.
Item 61.01 Scour……..7 We concur with this rating.
Item 62 Culvert……N
Railing……. 1 0 0 1 Railing on bridge has tubular back up but is too low for current Stds. Should be 0.
Item 72 Approach…….8 We concur with this rating.
Comments: See previous comments on comments.
Defect Photos: Need some more photos showing defects to back up rating and comments. One pic of one beam does not convey the entire message.
Channel Photos: Need to improve on photos, as the ones in Assetwise don't show everything that is required. Need better positioning to capture channel relative to piers and abutments. (The bridge is pretty long to get it all in from up or down stream. Multiple shots may help or perform the channel measurements as prescribed in the manual)

MAR-T028-0445 _D(5130611) Concrete Tee-beam

Item 58 Deck……6 We concur with this rating. (Note, Deck comments are under superstructure) In design, load rating and bridge type coding, the Tee portion of the beam is the deck, but for inspection purposes we keep them separate.
Item 59 Superstructure....5 As discussed in the field, comments need to be more accurate and include L E S. Which beams? How many? Measurements would be helpful. (Need defect photos, see photos below) The spalling is on both edge beams, but the 4 interior beams carrying the traffic load are in better condition. This can make a difference on how you rate the superstructure. If the beams were reversed the superstructure could go much lower.
Item 60 Substructure…….6 We concur with this rating. The loss of section near the fascia beam seats is getting close to the bearing area and should be noted for future monitoring.
Item 61 Channel…… 6 We concur with this rating.
Item 61.01 Scour…….7 We concur with this rating.
Item 62 Culvert……N
Railing……. 0 0 0 0 We concur with this coding.
Item 72 Approach……6 We concur with this rating.
Comments: See comments above
Defect Photos: See comments above
Channel Photos: You are almost there, so close on the photos. You need to capture more of the channel relative to both abutments looking back toward the bridge. Your angle is a little too acute to capture what FHWA is wanting.

MAR-T060A-0007 _(5135656) Corrugated Steel Culvert

Item 58 Deck……N
Item 59 Superstructure……N
Item 60 Substructure……. N
Item 61 Channel…… 6 We concur with this rating
Item 61.01 Scour……. 6 We concur with this rating
Item 62 Culvert……..5 We concur with this rating, your comments need to be a little complete and a couple of photos would help as well, focusing in of the rust and holes. Measurements are also great in order to determine the proper rating and get the omni-important L E S.
Railing…….. N N N N
Item 72 Approach……. 8 We concur with this rating.
Item 113 Scour Critical…. 8 We concur with this coding.
Comments: See Culvert Summary comments above
Defect Photos: See Culvert Summary comments above
Channel Photos: Only one in Assetwise. Need another from the other side. (We understand this was piped in until recently and a photo was not possible at the time)

MAR-T040A-0013 _(5131006) Steel Beams w/ timber deck

Item 58 Deck……6 We concur with this rating.
Item 59 Superstructure……5 We concur with this rating.
Item 60 Substructure……..5 Agreed, but needs comments
Item 61 Channel……..7 Agreed
Item 61.01 Scour……..7 Agreed
Item 62 Culvert……N
Item 36 Railing…….. 0 0 0 0
Item 72 Approach Alignment …….. 6 Agreed
Comments: See previous comments
Defect Photos: See previous comments
Channel Photos: Channel looked good pictures looked good (The photos are getting a little on the old side 2017.) You may want to think about some new ones, or if things are static, then state as much, since Scour Critical is a 5.

MAR-T055B-0223_(5131219) Pony Truss

Item 58 Deck…… 6 Agreed
Item 59 Superstructure……6 Agreed
Item 60 Substructure……5 Agreed
Item 61 Channel……..7 Agreed
Item 61.01 Scour……4 Agreed
Item 62 Culvert……5 Agreed *(Hole in CMP and void behind since plugged by county forces, but should remain a 5)*
Item 36 Railing…… 0 0 0 0 Agreed
Item 72 Approach Alignment …….. 6 Agreed
Comments: See previous comments
Defect Photos: See previous comments
Channel Photos: You have one good one and one not so good. We recommend retaking the east photo from a better vantage point to capture the channel and both abutments.

Inspection Reports Cont. (metric 12)

Comments: In general the field comments and Defect photos need to be more detailed and complete. The data check in Assetwise yielded similar results, as show below.

METRIC 12 - Routine Inspection								
Field Ratings		**# > +/-1**	**# Ratings**	**% PASS**		**COMPLIANCE**		
	field ratings	**0**	**24**	100.0%		(C)		
Comments		**Missing**	**# < 6**	**% PASS**				
Tab	Comments when Rating < 6	4	144	97.2%		(C)	MAR-C025A-0036 _(5130301)	MAR-C026X-2678 _(5130492)
		Error	**Total Scour**	**% PASS**			MAR-T040A-0013 _(5131006)	MAR-T137B-0159 _(5137217)
Comments	Rating should be = Scour	0	142	100.0%	within tolerance +/- 1			
Tab	Noncompliant Scour Rating Err	0	142	100.0%		(C)		

Channel Photos: in general, your bridges had mixed Channel Photos. The angle from which they are taken and getting both abutments in the frame would help in most cases.

Review of the bridge data showed **4 out of 144** bridges were missing comments in the scour item when the rating was <=5, and review of the 7 bridges in the field showed 0 bridges where comments were incomplete, missing sufficient detail with LES described in AssetWise when the rating was 5 or lower. This requirement became effective Nov of 2020.

Bridge Files (metric 15)

Marion County keeps files listed below as follows: Inspection reports, inventory values, inspection photos, inspection sketches, and channel cross section information is stored within ODOT's Assetwise database. All other information is stored with each respective bridge folder in Laserfiche on our Butler County servers, with the originals in physical office files. (From Questionnaire)

- Inspection reports, including old inspections In drafting room Flat File
- Design Calculations In Job Folder in Basement
- Plans In tax map flat file
- Load analysis calculations In bankers box
- Inventory forms Electronic On SMS
- Photos and sketches Electronic and Hard Copy Catalog
- Repairs and maintenance history Electronic and filed with bridge plans
- Scour evaluation On Inspection Field Report and Inspection Work Report
- Scour POA N/A
- Fracture Critical File In Bankers Box
- Load Posting/Closing In Bridge Book and Bridge Card
- Underwater inspections N/A
- Special inspection eqpt. or procedures N/A
- Flood data, waterway adequacy, channel cross sections N/A

Load Rating (metric 13)

The inventory shows 145 (100.00%) of the County NBIS bridges have been Load Rated or Load Rating was not applicable. There are **5** NBIS bridges evaluated by documented engineering judgement using the BR100 form.

Load Ratings were checked for **SFNs 5134390; 5131006; 5132429; 5138868.** 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 are considered not ratable.

5130522 TR 27-C – Concrete Box Beam Bridge with No Plans
5130611 TR 28-D – Concrete Beam Bridge with No Plans
5131294 CR 66-B – Concrete Beam Bridge with No Plans – To Be Replaced 2022
5133025 CR 193-C – Concrete Slab Bridge with No Plans

The 5 errors stem from a rounding formula in error check function

Load Rating Data

Load Rating Tab		# OF ERRORS	
Col. AN	Op RF greater than Inv RF?	0	
Col. AO	Posting and % Legal OK?	0	
Col. AP	"0" used instead of blank	0	
Col. AT	% legal <> lowest RF	5	Ok see comment
Col.A V	Item 70 correct?	0	
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	

(From Snapshot file)

136 NBIS bridges have plans and **0** bridges had an assigned load rating based on plan information. Only precast 3 and 4 sided culverts and precast bridges are permitted this designation.

Load Posting (metric 14)

Marion County has **12** 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	217	100.0%	(C)
Op RF = 0 but not closed	0	217	100.0%	(C)
% Legal < 100 but not posted	0	217	100.0%	(C)
Item 41 = B	0	217	100.0%	(C)

(From Snapshot File)

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

Fracture Critical Bridges (Metric 16)

The FC bridge inspection frequency is 12 months, done with routine annual inspections.
FC plans for **SFN; 5131944; 5132223** were reviewed the FCMs identified.

Gusset Plate calculations were satisfactory for both **SFNs 5131944; 5132223**

Underwater Inspections and Scour (metric 9 & 17) **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 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.

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 for Contract work is **$650,000.00-$750,000.00**
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 **$70,000.00.**

The chart on the following page is a review of the 23 Metrics used to measure NBIS compliance and the charts 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.

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
10	Need to get FC inspections done on time