National Bridge Inspection Standards &
Bridge Maintenance Program Review
Butler County
September 30, 2021

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

IN ATTENDANCE:

Greg Wilkins, County Engineer
Mark Sherman, CEAO Federal Bridge QA/QC Engineer
Mark Goodwin, Butler County
Nick Okuley, Butler County
Kar Singh, Butler County
David Quimby, Butler County
Mike Brokaw, ODOT
Alexis Bogen, FHWA

SCOPE OF REVIEW:

The review consisted of interviews with Butler County personnel, reviews of inspection and inventory data, and reviews of Butler County bridge records. The office evaluation assessed Butler 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
BUT-C0019-1310LL_(0934550)	Concrete Cont. Slab	5	same
BUT-C0019-1253 _(0934852)	Prestressed Box Beam	4	same
BUT-C0019-1224 _(0934542)	Concrete Cont. Slab	4	same
BUT-C0023-0229 _(0932604)	Prestressed Box Beam	4	same
BUT-T0265-0014 _ (0931101)	Steel Beam	4	same
BUT-C0053-0177 _(0934569)	Steel Culvert	5	same
BUT-T0058-0160 _(0931322)	Steel truss	4	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.

Butler County has inspection responsibilities for **409** bridges, **217** of which are longer than 20 feet in length and **192** 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:

Butler 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.
5 bridges were lacking comments for items rated less than or equal to 5. *(NOTE: the 5 missing scour comments in the scour item summary, actually had scour comments in both the channel summary and Substructure summary.)*

Frequency of Inspections (Metric 6 & 7)

Ohio State Transportation Laws require all State and local bridges to be inspected annually.
Butler County had **409** 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.
At the time of this review Butler County had over **60** bridges overdue for inspection.
(Note): Butler County has caught up with their bridge inspection schedule as of October 30.

Qualification and Duties of Personnel (metric 2)

Program Manager: & Reviewer: David Quimby
Yrs. Inspection related experience: _11 Years of Experience with Bridge Inspections
- List courses attended (& approx dates)

- Bridge Inspection Level 1 – May 2011
- Bridge Inspection Level 2 – June 2011
- SMS Training – February 2013
- SMS Open Lab – March 2014
- Element Level Inspection Training – April 2014
- Bridge Inspection Refresher Training – May 2019
- Advanced Inventory in AssetWise Training (Microsoft Teams) – June 2020

Team Leader: Mark Goodman
- Yrs. Inspection related experience: _11 Years of Experience with Bridge Inspections
- List courses attended (& approx dates)
  - Bridge Inspection Level 1 – May 2011
  - Bridge Inspection Level 2 – June 2011
  - SMS Training – February 2013
  - SMS Open Lab – March 2014
  - Element Level Bridge Inspection – April 2014
  - AASHTOWare BrR Training – December 2018
  - Bridge Inspection Refresher Training – June 2019
  - Advanced Inventory in AssetWise Training (Microsoft Teams) – June 2020

Team Leader: Nick Okuley
- Yrs. Inspection related experience: _4 Year Experience with Bridge Inspections
- List courses attended (& approx. dates)
  - AASHTOWare BrR Training – December 2018
  - Bridge Inspection Level 1 – November 2019
  - Bridge Inspection Level 2 – December 2019
  - Advanced Inventory in Assetwise Training (Microsoft Teams) – June 2020
  - 2021 ODOT Bridge Inspection Updates Webinar – March 2021

Load Rating Engineer: Kar Singh List Ohio PE # _66585

Underwater Bridge inspector:
Jason Hickey (Team Leader), P.E. #80700 ;
Zach Harrison (Diver) – Inspection was conducted through ODOT's 2019 underwater inspection contract.
- Yrs. Inspection related experience: _Unknown – Employees of consultant
- List courses attended (& approx dates)
  - NHI Safety Inspection of In-Service Bridge – April/May 2014 (Hickey)
  - NHI Underwater Bridge Inspection – December 2016 (Harrison)
  - NHI Bridge Inspection Refresher Training – November 2018 (Hickey)

Inspection Reports (metric 12)

As part of this review, **seven** 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:

BUT-C0019-1310LL_(0934550) 3 span Concrete Cont. Slab

Item 58 Deck…… 8 Agreed
Item 59 Superstructure……8 Agreed
Item 60 Substructure…….5 Agreed
Item 61 Channel……..8 Agreed
Item 61.01 Scour……..8 Agreed
Item 62 Culvert……N
Item 36 Railing……1 N 1 N (Should be 0 0 0 0 (not up to current Standards))
Item 72 Approach Alignment …….. 8 Agreed

Comments: Very good Comments
Defect Photos: Very good Defect Photos
Channel Photos: Very Good Photos

BUT-C0019-1253 _(0934852) Simple span Prestressed Box Beam
Item 58 Deck…… 4 Agreed
Item 59 Superstructure……4 Agreed
Item 60 Substructure……6 Agreed (within 1 pt. tolerance, we suggest a 7)
Item 61 Channel……..8 Agreed
Item 61.01 Scour……..8 Agreed
Item 62 Culvert……N
Item 36 Railing …… 1 1 0 1 Agreed
Item 72 Approach Alignment …….. 8 Agreed
Comments: Excellent Comments
Defect Photos: Very good Defect Photos
Channel Photos: Good Channel Photos

BUT-C0019-1224 _(0934542) 3 span Concrete Cont. Slab
Item 58 Deck…… 7 Agreed
Item 59 Superstructure……7 Agreed
Item 60 Substructure……4 Agreed
Item 61 Channel……..7 Agreed
Item 61.01 Scour……..7 Agreed
Item 62 Culvert……N
Item 36 Railing…… 1 1 1 1 Agreed
Item 72 Approach Alignment …….. 8 Agreed
Item 71 Waterway Adequacy ……..8 Sediment build-up is pronounced under span 1. While the inspector indicated that no overtopping has occurred, the bridge opening is not performing as design and should be monitored during heavy rain events. I would rate this item lower than an 8.
Comments: Excellent Comments
Defect Photos: Very good Defect Photos
Channel Photos: Good Channel Photos

BUT-C0023-0229 _(0932604) 3 span Prestressed Box Beam
Item 58 Deck…… 4 Agreed
Item 59 Superstructure……4 Agreed
Item 60 Substructure……6 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 …….. 7 Agreed
Comments: Excellent Comments
Defect Photos: Very good Defect Photos
Channel Photos: Good Channel Photos

BUT-T0265-0014 _ (0931101) Simple span Steel Beam
Item 58 Deck……..7 Agreed (Ok with 1 pt. tolerance, we suggest a 6 due to 100% section loss in deck pans in several locations)
Item 59 Superstructure……4 Agreed

Item 60 Substructure…….7 Agreed
Item 61 Channel……..6 Agreed
Item 61.01 Scour…….8 Agreed
Item 62 Culvert……..N
Item 36 Railing…….. N N 0 0 Should be 0 0 0 0 (not up to current Standards)
Item 72 Approach Alignment …….. 8 Agreed
Comments: Very good Comments
Defect Photos: Very good Defect Photos
Channel Photos: Good channel Photos

BUT-C0053-0177 _(0934569) Steel Culvert

Item 58 Deck…….. N Agreed
Item 59 Superstructure……N Agreed
Item 60 Substructure…….N Agreed
Item 61 Channel……..6 Agreed
Item 61.01 Scour…….5 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…….. N N 1 1 Agreed
Item 72 Approach Alignment …….. 7 Agreed
Comments: Very good Comments
Defect Photos: Very good Defect Photos
Channel Photos: Very Good Photos

BUT-T0058-0160 _(0931322) Simple span Steel pony truss
Item 58 Deck…….. 6 Agreed
Item 59 Superstructure……4 Agreed
Item 60 Substructure…….4 Agreed
Item 61 Channel……..9 Agreed
Item 61.01 Scour…….8 Agreed
Item 62 Culvert……..N
Item 36 Railing…….. 0 N 0 N (should be 0 0 0 0 (not up to current Standards))
Item 72 Approach Alignment …….. 8 Agreed
Comments: Very good Comments
Defect Photos: Very good Defect Photos
Channel Photos: Very Good (Photos)
(Bridge Replacement contract already out for bids.)

Comments: In general the field comments and Defect photos were very good.
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	5	208	97.6%	(C)
		Error	**Total Scour**	**% PASS**	
Comments	Rating should be = Scour	0	200	100.0%	within tolerance +/- 1
Tab	Noncompliant Scour Rating Err	0	200	100.0%	(C)

:

Channel Photos: All bridges had very good channel Photos

Inventory Items

Review of the bridge data showed **5 out of 208** 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. **(NOTE: the 5 missing scour comments in the scour item summary, actually had scour comments in both the channel summary and Substructure summary.)**

Bridge Files (metric 15)

Butler 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 INS
- Design Calculations DES
- Plans DES
- Load analysis calculations INS
- Inventory forms INS
- Photos and sketches DES
- Repairs and maintenance history INS\DES
- Scour evaluation NA
- Scour POA NA
- Fracture Critical File INS
- Load Posting/Closing INS
- Underwater inspections
- Special inspection eqpt. or procedures INS
- Flood data, waterway adequacy, channel cross sections INS

Load Rating (metric 13)

The inventory shows 217 (100.00%) of the County NBIS bridges have been Load Rated or Load Rating was not applicable. There are 22 NBIS bridges evaluated by documented engineering judgement using the BR100 form.

Load Ratings were checked for **SFNs 0931013; 0931608; 0934852.** 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.

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	0
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)

(Note: As with all of the data transferred from SMS to Assetwise and the addition of new vehicle types, there are a few Load Rating Factors missing for several vehicle types in both the NBIS bridge inventory and the non-NBIS inventory bridges. It is suggested that the county first systematically begin to add the load rating factors for those NBIS bridges missing them and work toward getting the load rating factors entered for all of their bridges.)

Load Posting (metric 14)

Butler County has **6** 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.

187 bridges had an assigned load rating based on plan information.

Only precast 3 and 4 sided culverts and precast bridges are permitted this designation. The nine bridges below are prestressed Box beam bridges coded as a 0 in Ohio item 708 Assigned. Highlighted in Blue are those bridges with plans coded a 1 in Ohio item 709, that can be assigned a rating based on plan information. Those highlighted in Red cannot and will need a different coding using engineering judgement, documented with a Br100 form, using Item 708 code as a 4, 7, 8, or 9.

BUT-T5009-0068 _(0934259)
BUT-T0084-0117 _(0932310)
BUT-T0084-0065 _(0932302)
BUT-C0030-0046 _(0931748)
BUT-C0030-0005 _(0931470)
BUT-C0029-0222 _(0933198)

BUT-T0060-0170 _(0934623)
BUT-T0025-0449 _(0931659)
BUT-C0033-0353 _(0930237)

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 0932892; 0935735** were reviewed and the FCM's identified.
Gusset Plate calculations were satisfactory for both **SFNs 0932892 & 0935735**.

Underwater Inspections and Scour (metric 9 & 17)
Butler County has two bridges that require dive inspections. SFNs 0936871 (2019); 0935360 (2020) by Terracon
Both have been inspected with in FHWA parameters.

METRIC 16 - Fracture Critical Inspection				
From Files review	**Missing**	**# FC**	**% PASS**	**COMPLIANCE**
Fract Critical Member ID	0	2	100.0%	(C)
Fatigue Prone Detail	0	2	100.0%	(C)
Gusset Plate Calculations	0	2	100.0%	(C)
FC Inspection Procedure	0	2	100.0%	(C)
METRIC 17 - Underwater Inspection				
From Files review	**Missing**	**# UW**	**% PASS**	**COMPLIANCE**
UW Inspection Procedure	0	1	100.0%	(C)
Location of UW elements	0	1	100.0%	(C)
UW frequency identified	0	**1**	100.0%	(C)

From Snapshot file

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 $700,000.00
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 $250,000.00.

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.

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 needed in the following Metrics:

Metric 6: County needs to catch up on inspections that are overdue.

Metric 13: County needs to re-evaluate the 6 box beam bridges that have no plans and assigned a load rating.