

**National Bridge Inspection Standards &
 Bridge Maintenance Program Review
 Montgomery County
 October 29, 2013**

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

IN ATTENDANCE:

Stephanie Goff, Senior Engineer
 Cedrick McGhee, Engineer II
 James Poston, Team Member
 Cleatus Sanders, Team Leader
 Mark Schaub, Team Leader
 Mark Stockman, CEAO Federal Bridge QA/QC Engineer

SCOPE OF REVIEW:

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

SFN	CTY-RTE-SECT	TYPE	YEAR BUILT /REHAB	OVERALL LENGTH	County RATING	Suggested NBIS RATING
5748399	MOT C0007-0436	321	1992	44'	7A	same
5740193	MOT C0019-0383	395	1975	13'	5A	same
5740363	MOT T0140-0161	231	1963	46'	4A	4A*
5730090	MOT C0228-0055	111	1958	27'	6A	same
5736013	MOT C0074-0083	395	1968	17'	5A	same
5738156	MOT-C0023-0035	322	1962/85	330'	6A	same
5734452	MOT C0526-0154	176	1986	14'	6A	same
5746191	MOT C0041-0059	231	1965	60'	4A	4A*

* Top flange of beams (steel and concrete) are poor condition. Load rating should be investigated and posting considered.

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 NHS system beginning April 1, 2015.

Montgomery County has inspection responsibilities for 481 bridges, 290 of which are longer than 20 feet in length and 191 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. Montgomery County records showed 511 bridges but their records include the county bridges that the city inspects per agreement. This will change in 2015 when the county takes over inspecting their own bridges. The county should review compare their list against the one from the BMS and assure that all bridges are properly included. Review of the inventory span lengths showed possible 12 bridges had the NBIS Y/N coded incorrectly. The county will review the lengths and make any corrections necessary.

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"), and there are only minor issues in regards to complete compliance with the National Bridge Inspection Standards (NBIS). Comments are listed below.

Inspection Procedures

Montgomery County uses their own staff to do the inspections. The inspector brings a paper inspection form to the bridge. Comments from the previous inspection are brought to the bridge. Ratings are marked up on paper in the field and are put into the BMS using the CEAO program or direct entry to the BMS. Comments are written on the BR-86 paper form. The county was informed that ratings of 5 or lower require complete comments describing Location, Extent, and Severity, (LES) including pictures or sketches. The comments that the county has been making were sometimes quite thorough, but a few bridges were missing the Location descriptions, and in 2 other cases, were missing the LES details. Montgomery County inspection personnel are inspecting bridges in compliance with the Manual and the NBIS. The ratings properly reflected the field conditions when compared to the Manual.

A review of the BMS inspection records indicated that an average of 2.4 inspections per day were completed in 2012 and the highest number was 7 inspections per day. The inspections include some smaller bridges between 10'-20' as well as NBIS length bridges. The county was advised that a high number of inspections per day (>10), while not a violation of the NBIS, it could result in deeper scrutiny of the inspection bridge program. Their frequency of inspections is well within the recommended limits.

The County uses the city of Dayton snoopers for 16 bridge inspections every other year. In addition, they will use the ODOT UB50 for the Sellars Road Bridge over the Great Miami River once every 5 years. The inspector does use photographs to document deficient bridge conditions and photographs are available for every bridge.

Frequency of Inspections

Ohio State Transportation Laws require all State and local bridges to be inspected annually. Montgomery County was current on all annual inspections. The NBIS maximum inspection frequency of two years is met. All Bridges over 10 feet in length are inspected annually. Two bridges are inspected every six months, HUB-218-7.36 and DAY-HARSH-0.17.

Qualification and Duties of Personnel

Mr. Paul Gruner is the County Engineer and as such has overall responsibility for the bridge program. He is a PE and PS.

Ms. Stephanie Goff is the Program Manager and Reviewer. She is a PE and PS and has approximately 10 years inspection experience. She took the ODOT Bridge Inspection training in 1996 and the Level 2 Bridge Inspection course in 2012. She also took the Refresher (SMS class) in 2013. She is qualified as a Program Manager and Reviewer.

Mr. Cleatus Sanders is also qualified as a bridge inspection team leader. He has approximately 18 years of bridge inspection experience. Also, Mr. Sanders has taken the ODOT level 1 and 2 Bridge Inspection classes in 2009 and the SMS Refresher training in 2013. He is qualified as a Team Leader.

Mr. Cedric McGhee is a PE and has taken the ODOT level 1 and 2 Bridge Inspection classes in 2009 and the Refresher (SMS class) in March 2013. He has 16 years inspection experience. He also serves as a Reviewer. He is qualified as a Team Leader and Reviewer.

Mr. Mark Schaub completed the ODOT Level 1 and 2 Bridge Inspection classes in 2006. He has 9 years inspection experience and took the Refresher class (Annual Inspectors Meeting) in 2010. He is qualified as a Team Leader.

Mr. James Poston has taken the ODOT Level 1 and 2 Bridge Inspection classes in 2012 and the Bridge Inspection Refresher training later in 2012. He has 2 years inspection experience. He is qualified as a Team Member.

Inspection Reports

As part of this review, eight bridges were field reviewed to compare conditions with the most recent BR-86. The General Appraisals for all 8 bridges matched the Manual. One Summary Item differed from the Manual by 1 rating, which is allowed. Summary items correspond with the NBIS inspection items. All discrepancies were discussed at the bridge site. The inspection condition ratings were done in compliance with the Manual.

Inventory Items

During the Field Review, the CEAO QA/QC Engineer checked select inventory items and the following minor issues were found:

- SFN 5740193 had the Culvert Type incorrect (item 131). It should be Arch, not Pipe Arch.
- SFN 5748399 and 5740193 had incorrect ratings in the guardrail survey Item 69.
- SFN 5730090 still has some inventory items coded from the previous structure. The type of Deck Drainage (item 59), Max. Span Length (item 65), and Approach Roadway width (item 49) were incorrect.
- SFN 5736013 had the wrong skew. It was coded as 0 degrees but it is actually around 30 to 45 degrees. Also the Approach Roadway width (item 49) was incorrect.
- SFN 5738156 had the wrong Main Member Type (item 121). It should be rolled steel instead of Welded Built Up. Also the Approach Roadway Width (item 49) should be 28' instead of 20' and it had an incorrect rating in the guardrail survey Item 69
- SFN 5734452 had a wrong Structure Type. It should be a Concrete Frame, not Concrete Culvert due to the shallow cover. Depth of Fill (item 129) should be 1 foot instead of 2 feet. There were also incorrect ratings in the guardrail survey Item 69.
- SFN 5746191 had incorrect coding for the Approach Roadway Alignment (item 89). It should be coded 8, not 6.

During the Office portion of the review, additional inventory items in the BMS were checked the following were found:

- Discrepancies were found on 5 bridges where the # of Spans and Span Length did not correlate to the Overall Length. SFN's 5752612, 5740541, 5740878, 5746302, 5744653. These bridges should be checked to be sure the codings are correct.
- 11 bridges coded as concrete culverts showed a depth of cover of 2', which means the bridges should be coded as concrete frames. However, there could be round off issues involved since the depth of cover is coded to the nearest foot. The county will check this and make corrections as necessary.

Also during the review of the BMS data, 3 (1.0%) bridges showed the General Appraisal did not match the lowest of the Superstructure, Substructure, or Culvert Summaries. This should be improved. Also, the 1-4 codes correlation to 0-9 codes was very good, finding only 4 (0.1%) instances of inconsistency. If deviations in the 1-4 coding are necessary, then the inspection comments should explain why.

Files

Montgomery County maintains Bridge files mostly in hard copies. Plans are stored on computer, photos are on computer, and all other information is stored in the bridge folder in filing cabinets.

Bridge load rating files for SFN 5734290, 5765366 and 5734118 were checked and found satisfactory, including the PE name and stamp of the load rating engineer. Section loss is accounted for in the calculations.

FC files for SFN 5760380 and 5740762 were checked and the FCM's were shown and identified. The bridges did have a Fracture Critical Plan and also included Fatigue Prone details. The FP Details for SFN 5740762 could be improved by labeling the E&E' details.

Gusset plate calculations were checked for SFN 5740762 and found satisfactory. The Gusset Plate calculations included the unstiffened edge length test.

The UW inspection file was reviewed for SFN 5770629. An Inspection Procedure was included, location of the UW elements were identified and the Frequency of Inspection was stated. The inspection report shows a Team Leader was present.

The Scour Plan of Action was reviewed for Bridge SFN 57360198 and found satisfactory. Improvements were suggested for the Monitoring Plan, tying it to a frequency of storm that would trigger the monitoring.

Load Rating

The inventory shows 289 (100.0%) of the County bridges have been load rated or evaluated with Engineering Judgment and 1 bridge the load rating was not applicable because it is a pedestrian/bikeway bridge.

Load Posting

The BMS showed Montgomery County has 2 bridges that are load posted for capacity and 1 posted for other reasons. 1 bridge is closed. If the county needs to post a bridge they use Operating Rating to post their bridges and both Silhouette and Gross Tonnage signs are used.

Special Features

The County has no bridges with special features. As defined by the Manual.

Fracture Critical Bridges

Montgomery County has 2 fracture critical bridges. All FC inspection are current.

Underwater Inspections and Scour

12 bridges need an Underwater inspection according to the BMS. All 12 are current on the inspection schedule. The county also inspects 8 other bridges with underwater techniques, for a total of 20.

QA/QC

The county does use reviews and continued training for QA/QC purposes. The QA/QC section of the new Bridge Inspection Manual meets the FHWA requirement.

Critical Findings

The county did not have a Critical Findings procedure at the QAR review. They created one after the QAR review, having adopted the ODOT flowchart.

Bridge Maintenance

The County has 3 county bridge crews of 3 men each to do bridge work. Work performed on bridges includes cleaning, deck sealing, asphalt repairs, guardrail, and erosion control.

The county has a contract construction program that does complete replacements and rehabilitation work. The county uses federal funds and does use credit bridge funds.

Plans for emergency projects are done by the bridge crew, office staff, or consultants, depending on the nature of the repair. The work is done by county forces or consultants, depending on the extent of the work. Projects are selected by inspection conditions, sufficiency rating or functional obsolescence, coordination with other projects, and public complaints. Projects are then prioritized by risk and impact to the public, available funding and cost. Labor, equipment and materials are all documented.

CONCLUSIONS AND RECOMMENDATIONS

1. The following should be corrected:

- SFN 5740193 had the Culvert Type incorrect (item 131). It should be Arch, not Pipe Arch.
- SFN 5748399 and 5740193 had incorrect ratings in the guardrail survey Item 69.
- SFN 5730090 still has some inventory items coded from the previous structure. The type of Deck Drainage (item 59), Max. Span Length (item 65), and Approach Roadway width (item 49) were incorrect.
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2. The county includes city inspected bridges on the county system in their inventory, and the BMS does not because they are coded as city inspection responsibility. (the city is inspecting these county bridges by agreement). This will change in 2015 when the county takes over all their bridges and the city stops doing the inspections. The county should review the bridges to be sure all are being inspected by the proper entity and the number of bridges is correct in the BMS.
3. Review of the inventory span lengths showed possibly 12 bridges had the NBIS Y/N coded incorrectly.
4. Comments should be improved to assure that Location, Extent and Severity are properly described, especially when the GA<6.
5. Five bridges need the span, # of spans, and overall length checked

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 eight 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

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 ** 95%				
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 ** 94%				
23	Updating of Data				

* based on office review

** based on results of Field Review

Metric	Action Needed
22	Check inventory items during inspection