

**National Bridge Inspection Standards &  
 Bridge Maintenance Program Review  
 Mercer County  
 October 1, 2019**

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

**IN ATTENDANCE:**

Jim Wiechart  
 T.J. Smalley  
 Mark Stockman, CEAO Federal Bridge QA/QC Engineer

**SCOPE OF REVIEW:**

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

| <u>SFN</u> | <u>CTY-RTE-SECT</u> | <u>TYPE</u> | <u>YEAR BUILT /REHAB</u> | <u>OVERALL LENGTH</u> | <u>County RATING</u> | <u>Suggested NBIS RATING</u> |
|------------|---------------------|-------------|--------------------------|-----------------------|----------------------|------------------------------|
| 5446899    | MER T0091 03.680    | 321         | 1970                     | 61'                   | 6A                   | 7A                           |
| 5431611    | MER C0236 03.030    | 231         | 1985                     | 63'                   | 5A                   | same                         |
| 5431182    | MER C031A 11.360    | 231         | 2003                     | 63'                   | 7A                   | same                         |
| 5446848    | MER T0091 02.140    | 121         | 1989                     | 28'                   | 6A                   | same                         |
| 5459419    | MER T021C 01.730    | 121         | 2004                     | 36'                   | 6A                   | same                         |
| 5450918    | MER C0180 03.350    | 231         | 2007                     | 40'                   | 7A                   | 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. Mercer County has 0 bridges on the expanded NHS.

Mercer County has inspection responsibilities for 382 bridges, 259 of which are longer than 20 feet in length and 123 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. However, 1 bridge SFN 5444357 needed a correction in Item 48, Max. Span. It should be the same as Item 306 NBIS length for concrete slabs. 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"). Comments are listed below.

### **Inspection Procedures**

Mercer County uses their own staff to do the bridge inspections. Previous inspection reports are available at site for review. The inspections are recorded in field on paper and transferred to a WORD file. They are brought to the next bridge inspection. The inspector uses photographs to document deficient bridge conditions, and photographs are available for every bridge. Comments are recorded on a separate paper and not put in SMS. The bridge plans are not carried to the bridge site, but are available at the bridge office.

The county indicated that an average of 10 inspections per day were completed in 2018. For Truss (pony/through/deck) it takes about 4 hours. It takes 45 minutes for Beam/Girders. For a slab, it takes 45 minutes. For a Culvert, it takes ½ hour.

The County does not have any bridges that uses a snooper.

### **Frequency of Inspections**

Ohio State Transportation Laws require all State and local bridges to be inspected annually. Mercer County had 382 bridges inspected in 2018. The NBIS maximum inspection frequency of two years is met. All Bridges over 10 feet in length are inspected annually. There are currently no bridges that require inspection more frequently than one year.

### **Qualification and Duties of Personnel**

Mr. James Wiechart, P.E. and P.S. is the Program Manager, Reviewer, and Team Leader. He has approximately 26 years of inspection experience. He took the ODOT Bridge Inspection Training Level 1 and 2 in 1994, 1995, and 1997. He took a LTAP Bridge Inspection Refresher

in 2017 and AASHTOWare BrR training in 2018. He is qualified as Program Manager, Reviewer, and Team Leader.

Mr. T.J. Smalley is also a Team Leader. He has had 7 years of inspection related experience. He took Level 1 & 2 Inspection Training in 2008 and 2009. He took a SMS training in 2013 and Bridge Refresher Course in 2019. He is qualified to be a Team Leader.

Mr. James Wiechart, PE #62338 did the load ratings. He is qualified to do load ratings.

## Inspection Reports

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 six 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. All discrepancies were discussed at the bridge site.

## Inventory Items

During the Office Review, the following were found.

- FC Y/N switch and Dive Y/N switch are blank for 6 bridges. This needs to be completed at the next inspection
- Ohio% Legal Should be capped at 150% for 6 bridges. **3 have ben fixed and 3 are remaining. Note – Rating factors are not capped but % Legal is capped at 150%**
- Item 575 for SFN 5435064 needs to be changed from 0 to D and SFN 5437490 needs to be changed from 4 to 7.
- 5454679 had numerous errors in the load rating coding. **They have all been corrected.**
- Numerous bridges had errors in the legal load rating factors. **They have been corrected.**

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

- SFN 5446899 Superstructure Items should be 7 and not 6. Also, General Appraisal should be labeled 7A and not 6A. Item 414 – Expansion Joint should not be Metal Finger. It is an angle joint.
- SFN 5431611 Comments are needed. Item 113 Scour should be 5 and not rated an 8.
- SFN 5431182 Item 113 Scour should be a 5 and not rated a 9.
- SFN 5446848 Item 475 Main Member should be coded a Beam instead of Other
- SFN 5459419 Item 113 Scour should be a 5 and not rated a 9. Item 475 Main Member should be coded a Beam instead of Other.
- SFN 5450918 Item 113 Scour should be 5 and not rated an 8. Item N36 Safety Features: Tr, Gr, Tm should all be a 0 and not labeled a 1. Also N36 Safety Features: Rail should be a 0 and not a 1. Item c34 Abutment Caps should not be rated since wall type abutments do not have caps.

## **Files**

Mercer County maintains inspection reports, including old inspections, design calculations, load analysis calculations, inventory forms, photos and sketches, repairs and maintenance history, scour evaluations, scour POAs, fracture critical files, load posting/closing, underwater inspections, and flood data in files and in the bridge file cabinet. Bridge plans are kept in the scanner drive.

## **Load Rating**

The inventory shows 259 (100.0%) of the County bridges have been Load Rated or Load Rating was not applicable. 1 was evaluated by documented engineering judgement. It has a BR100 form. The County was also reminded that any bridges with the General Appraisal moving from a 5 to 4 triggers a new load rating.

Load Ratings were checked for SFNs 5459850, 5454697, 5442842, 5444225. The load posting at the bridge matched the load ratings. PE name and stamp was on all the bridges, except for SFN 5442842 and SFN 5444225 which both need a cover letter. A PE stamped cover letter is indicated for all bridges that were load rated using the ODOT spreadsheet.

## **Load Posting**

Mercer County has 2 bridges that are load posted. This is determined by a mix of engineering judgment and analysis. There are 0 bridges that closed for condition ratings. They use both gross tonnage and SHV sign for load posting. Posting is based on Operating Rating.

## **Special Features**

The County has no bridge with special features.

## **Fracture Critical Bridges**

Mercer County has 3 bridges labeled as a fracture critical bridge in the SMS. 3 bridges have gusset plates.

FC bridges SFN 5455022 and SFN 5454697 files were checked. They included the FCM's. The Fatigue Prone details were not shown and the procedure was not written and detailed. They will need to do both of those things.

Gusset Plate calculations were checked for SFN 5459850 and SFN 5454697. They both contained a PE stamp and the Unstiffened Edge length test.

The county needs to add the Fatigue Prone details and a written inspection procedure to the bridge file for the 6 FC bridges.

## **Underwater Inspections and Scour**

0 bridges need an underwater inspection. There are 0 bridges considered to be Scour Critical.

## **QA/QC**

The QA/QC section of the 2014 Bridge Inspection Manual meets the FHWA requirement.

## **Critical Findings**

The county does have a Critical Findings Procedure in place. Inspectors inform maintenance personnel of routine bridge maintenance problems in written form. When emergency repairs or critical findings are necessary, inspectors notify the bridge supervisor. A work order is written. The county was notified that they need to use the SMS Critical Findings Report. Kirk Borns, the sign manager, and the applicable bridge inspector checks the proper placement of signs.

## **Bridge Maintenance**

The County does force account bridge work as needed. They use a crew of 3 full-time employees including office support administration. Work performed on bridges include all rehab, reconstruction, repair, and maintenance. Approximately \$1,000,000 is budgeted for force account work annually.

The county has a contract repairs and replacement procedure in place. They typically only contract for some significant rehabs and replacements. The approximate annual budget is \$800,000. The County does use Fed Funds and Credit Bridge Funds.

Projects are identified and selected by the condition of the inspections and inventory attributes coupled with funding opportunities. Plans are developed for emergency repairs by the County Engineer, in coordination with in-house technical staff and the bridge supervisor, formulates the needed plans. Emergency repairs are done in most cases in-house bridge employees. All jobs are tracked by the job/project accounting system that is in place. Any on-call supervisor can close a road. The proper signage is obtained and Mercer County Central Dispatch is notified and the signage is placed to empowered to order emergency road closures.

## **CONCLUSIONS AND RECOMMENDATIONS**

The following inventory errors should be addressed:

- SFN 5444357 needed a correction in Item 48, Max. Span. It should be the same as Item 306 NBIS length for concrete slabs.
- The county needs to add the Fatigue Prone details and a written inspection procedure to the bridge file for the 6 FC bridges.
- FC Y/N switch and Dive Y/N switch are blank for 6 bridges. This needs to be completed at the next inspection

- Ohio% Legal Should be capped at 150% for 6 bridges. **3 have been fixed and 3 are remaining. Note – Rating factors are not capped but % Legal is capped at 150%**
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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 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

| Metric | Action Needed   |
|--------|---|
| 16     | add written inspection procedures and Fatigue Prone details to the FC files |