

# National Bridge Inspection Standards & Bridge Maintenance Program Review Pike County June 30, 2014

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

## IN ATTENDANCE:

Jim Rapp, Pike County Engineering Assistant  
Mark Stockman, CEAO Federal Bridge QA/QC Engineer

## SCOPE OF REVIEW:

The review consisted of interviews with Pike County personnel, reviews of inspection and inventory data, and reviews of Pike County bridge records. The office evaluation assessed Pike 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 Pike 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
6630650	PIK C0068-0419	121	1950	34'	6A	7A
6634516	PIK 00069-0084	395	1970	21'	4A	same
6632424	PIK C0084-0288	195	1930	23'	6A	same
6632041	PIK 00024-0086	321	1945	21'	3P	same
6633528	PIK C0079-0176	321	1950	18'	6A	same
6633641	PIK T0219-0002	321	1960	15'	6A	5A
6633102	PIK 00241-0015	321	1965	58'	5A	6A
6632017	PIK 00003-0631	34A	1991	67'	6A	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 NHS system beginning April 1, 2015.

Pike County has inspection responsibilities for 337 bridges, 168 of which are longer than 20 feet in length and 169 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. Pike County records also showed the same number of bridges. Review of the inventory span lengths showed 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"), and there are only minor issues in regards to complete compliance with the National Bridge Inspection Standards (NBIS). Comments are listed below.

### **Inspection Procedures**

Pike County uses their own staff to do most of their bridge inspections. They use a consultant to the worst bridges. The inspector brings last year's inspection to the bridge on a paper form and changes are marked on the old BR-86. Comments from the previous inspection are also brought to the bridge. Ratings are put into the SMS in the office. Comments are recorded on the inspection form and on an Excel spreadsheet and hard copies are kept in a binder. The county was informed that ratings of 5 or lower require complete comments describing Location, Extent, and Severity (LES), including pictures and/or sketches. The comments that the county has been making should be improved in detailing the Location, Extent, and Severity of the defects.

A review of the BMS inspection records indicated that an average of 8.2 inspections per day were completed in 2013 and the highest number was 25 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, could result in deeper scrutiny of the inspection bridge program.

The County uses the ODOT snoopers to inspect 5 bridges on a 3 year schedule. That may change based on the availability of the ODOT snoopers. The bridges do not necessarily require a snoopers. They will reassess the needs for a snoopers if necessary. 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. Pike 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.

## **Qualification and Duties of Personnel**

Mr. Denny T. Salisbury is the County Engineer and as such has overall responsibility for the bridge program. He is a PE and PS and he serves as the Program Manager and Reviewer. He has 13 years inspection experience. He took the ODOT Level 1 & 2 Bridge Inspection courses in 2001 and the Inspection Refresher in 2014. He is qualified as a Program Manager and Reviewer.

Mr. James Rapp is the Team Leader. He has 7 years inspection experience and he took the ODOT Inspection courses in 2007. He took the Inspection Update in 2011 and the SMS Training in 2013. He is qualified to be a Team Leader.

Mr. John Wackerly is also a Team Leader. He is a PE and has approximately 27 years inspection experience. He has taught the ODOT comprehensive bridge inspection-training course since 1996 and is a NHI Certified Instructor teaching the NHI 2 week Bridge Inspection course and the Fracture Critical Member course, most recently in 2012. He has taken a Refresher Training, the SMS class in 2013. He is qualified to be a Team Leader.

Denny Salisbury and several consultants have done the Load Ratings. Mr. Salisbury is a registered Professional Engineer in Ohio, license number 045559. He is qualified to do load ratings. The consultants are WD Partners, Carpenter Marty, and Columbus Engineering.

## **Inspection Reports**

As part of this review, eight bridges were field reviewed to compare conditions with the most recent BR-86. The individual condition ratings 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 Field Review, the CEAO QA/QC Engineer checked select inventory items and the following issues were found:

SFN 6630650 had the Deck Drainage coded as Scuppers and it should be Off the Ends. The Approach Roadway Width was coded as 21' and it should be 34'.

SFN 6632424 had the Guardrail Survey items incorrect.

SFN 6632041 had the Approach Roadway Alignment coded as 6, it should be 8.

SFN 6633641 had the Approach Roadway width coded as 13' and it should be 21'.

SFN 6632017 had 3 of the 4 Guardrail Survey items incorrect.

During the office review, several items were found:

5 bridges had the Type Service on Bridge coded as RR but the Inventory item "Facility Carried" showed the name of the road under the bridge, not the RR on the bridge. "Facility Carried" refers to the traffic on the bridge. The county indicated the RR was on the bridge and they would make the correction in the Facility Carried field.

5 bridges showed BMS Item 71 Foundation Type for the Pier coded as Unknown but they are single span bridges and have no piers, therefore they should be coded as N.

Also during the review of the BMS data, 168 (100.0%) bridges showed the General Appraisal did match the lowest of the Superstructure, Substructure, or Culvert Summaries. This is good. Also, the 1-4 codes correlation to 0-9 codes should be checked, showing 19 (0.5%) instances of inconsistency. This is within reason. However, if deviations in the 1-4 coding are necessary, then the inspection comments should explain why.

### Files

Pike County maintains Bridge files in filing cabinets for each bridge, filed by bridge number. Inventory forms and some load ratings are kept in separate files. Most of the items listed as significant components in Metric 15 are in place. Following is a review of one bridge file. Scour Evaluations have been done mentally. The county was advised to add written Scour Evaluations to the file if needed (where stream could cause problems).

SFN .....	__ 6633528 _____
Inspection Reports .....	__ Yes _____
Inventory, photos, repairs .....	__ Yes _____
Load analysis calculations .....	__ Yes _____
Load posting documentation .....	__ Yes _____
Critical Findings .....	__ Yes _____
Scour Evaluation .....	__ Yes _____
Scour POA .....	__ Yes _____
Significant Correspondence .....	__ Yes _____
Special eqpt./procedures .....	__ Yes _____
Waterway data, flood, channel, etc. ...	__ only what is on plans

Bridge load rating files for SFN 6634613, 6633823, 6633153 and 6633041 were checked and found satisfactory except that 6633041, which is an engineering judgment load rating, did not contain a PE name and stamp. This should be added. SFN 6633041 was load rated by engineering judgment and documentation was in place, however, a better description of the rationale for the load rating should be included.

## **Load Rating**

The inventory shows 168 (100.0%) of the County bridges have been load rated or evaluated with Engineering Judgment. 15 bridges were evaluated by documented engineering judgment, and the documentation was in the file for the sample tested. The county reported they had a documentation for each bridge coded as documented engineering judgment.

## **Load Posting**

The BMS showed Pike County has 12 bridges that are load posted for capacity and 2 for other reasons. 2 bridges are closed. If the county needs to post a bridge they use Operating Rating to post their bridges and Silhouette signs are used.

## **Special Features**

The County has 0 bridges with special features.

## **Fracture Critical Bridges**

Pike County has 12 fracture critical bridges. FC Inspections were done within the 2 year time frame.

FC files for SFN 6333455 and 6333099 showed the FC members and the Fatigue Prone Details (FPDs) were identified and the FC Inspection Procedure was done. Everything was satisfactory.

Gusset Plate calculations were reviewed for SFN 6333455 and 6333099 and found satisfactory, including the unstiffened edge length test and the PE name and stamp.

## **Underwater Inspections and Scour**

0 bridges need an underwater inspection.

1 bridge was coded as Scour Critical. The Scour POA for this bridge SFN 6333072 is in place and is complete, including a frequency of storm method of monitoring (10 yr. frequency was used). All bridges have been evaluated for scour and none are scour critical. Scour Evaluations were done visually with no written assessments. The county was advised to make written assessments if needed (the stream shows conditions that could lead to scour of the bridge foundations).

## **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, using the flowchart developed by ODOT. It meets the requirements of Metric 21.

## **Bridge Maintenance**

The County does force account bridge work as needed. They do not have a dedicated bridge crew but use their regular crews (14) to do bridge work. Work performed on bridges includes minor maintenance, guardrail repairs, debris removal, etc.

The county has a contract construction program that does complete replacements, and all other major repairs. There is not a separate bridge budget but funds are taken from the county budget as needed. The County federal funds when available which includes the use of credit bridge funds.

Plans for emergency projects are done in house by the County engineer or consultants (for large work). The work is done by county forces or contractors, depending on the nature of the work. Projects are selected by Sufficiency Rating, General Appraisal, and inspection recommendations from the bridge inspectors. Labor, equipment and materials are all documented.

## **CONCLUSIONS AND RECOMMENDATIONS**

1. The following should be corrected:

SFN 6630650 had the Deck Drainage coded as Scuppers and it should be Off the Ends. The Approach Roadway Width was coded as 21' and it should be 34'.

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5 bridges showed BMS Item 71 Foundation Type for the Pier coded as Unknown but they are single span bridges and have no piers, therefore they should be coded as N.

2. Also during the review of the BMS data, 168 (100.0%) bridges showed the General Appraisal did match the lowest of the Superstructure, Substructure, or Culvert Summaries. This is good. Also, the 1-4 codes correlation to 0-9 codes should be checked, showing 19 (0.5%) instances of inconsistency. This is within reason. However, if deviations in the 1-4 coding are necessary, then the inspection comments should explain why.
  
3. Scour evaluations should be written and placed in the file for all bridges over water if the channel conditions indicate potential scour issues.
  
4. Comments should be improved to assure that Location, Extent and Severity are properly described, especially when the Summary Rating  $\leq 5$ . Summary ratings 6 or higher can use nominal comments.
  
5. 1 sampled Load Rating did not have a PE stamp and signature. A cover letter containing the PE stamp and signature may be used to accompany all load ratings that do not have a PE signature and stamp.
  
6. Load Ratings using documented engineering judgment should have a description of the rationale behind the decision of rating the bridge a certain way.

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 ** 100%				
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 ** 93%				
23	Updating of Data				

\*\* based on results of Field Review

Metric	Action Needed
13	add PE name and stamp to all load ratings