

# FHWA Final Summary of Metric

# MICHIGAN

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## Metric Number: 01 – Bridge Inspection Organization

Assessment Level: Minimum

### Metric Summary

#### **Extent of Review:**

Metric was assessed based on previous review results, and on the reviewer's knowledge and awareness of the States Bridge Inspection Organization.

Intermediate assessment performed in PY2017.

#### **Observations:**

The States bridge inspection organization is led by an efficient/effective NBIS program manager. The NBIS program manager strives to meet/exceed the requirements of the NBIS and expects all other responsible parties to meet the requirements set forth in the NBIS and the Michigan Structure Inspection Manual (MSIM). The MSIM is a state resource that clearly describes the requirements set forth in the NBIS, and the additional requirements set forth by the state of Michigan.

The NBIS program manager is the accountable senior staff member with oversight responsibility for the State's bridge inspection program and is responsible for management of the institutional risks. The NBIS program manager delegates/shares functions with staff throughout MDOT (organizational roles, and responsibilities can be found in the MSIM), these delegated/shared functions included the following:

- Development of policies and procedures for bridge inspection, load rating, and management.
- Development and analysis of bridge information for statewide planning.
- Collection and management of all bridge inventory, inspection, and load rating data.
- Maintenance and operation of the State's database and web application.
- Reporting of NBI and Element Level data to FHWA.
- Completing Quality Assurance Reviews for state and local agencies.
- Maintenance of a Training and Certification program for bridge inspection Team Leaders.
- Coordination of statewide Scour Assessment program.
- Oversight of the load rating and posting of Local Agency maintained structures.  
Load Rating and Posting of State-owned structures.
- Operation and maintenance of Michigan's bridge inspection equipment.
- NBIS compliance for all the bridges in the State of Michigan.

MDOT delegates inspection responsibilities to the appropriate responsible party (MDOT Regions/Local Agencies Owners) throughout the state of Michigan. Organizational roles, and responsibilities can be found in the MSIM.

To facilitate the efficient management and oversight of the MDOT Inspection Program, MDOT performs yearly QA/QC reviews on select MDOT Regions and Local Agencies. The objective of the yearly QA/QC review is to raise awareness of the National Bridge Inspection Standards (NBIS) and NBIP requirements, improve the accuracy/consistency of inspections, and ensure proper documentation is retained.

Based on the actions taken to maintain/improve compliance with the other 22 metrics it was determined that State's bridge inspection program is effective.

**Findings:**

None for this Section.

**Conclusions:**

Compliant. The State has assigned responsibility to an NBIS program manager and had clearly defined roles and responsibilities for delegated functions. The State's bridge inspection program is effective as indicated by assessment of the other 22 metrics.

This determination was based on the Divisions review of the National Bridge Inspection Standards for bridge inspection organizations (23 CFR §650.307), the National Bridge Inspection Program Compliance Criteria, previous review results and the reviewer's knowledge and awareness of the States Bridge Inspection Organization.

**Recommendations:**

None for this section.

## Metric Number: 02 – Qualifications of Personnel – Program Manager

Assessment Level: Intermediate

### Metric Summary

#### **Extent of Review:**

Metric was assessed based on the NBIS (Brian Zakrzewski)/Bridge Inspection (Allie Nadjarian) Program Manager's qualifications and knowledge of the State's program. Qualifications/knowledge were verified through an interview and documentation review.

#### **Observations:**

Brian Zakrzewski (resume/certification attached) holds a Bachelors (CY 1999) of Science in Engineering from Michigan Technological University. Brian is a Professional Engineer (License Number 6201051461) in the State of Michigan and is the NBIS Program Manager for MDOT. Brian has completed the comprehensive bridge inspection training course required by the NBIS and the periodic bridge inspection refresher training in accordance with MDOT's policy. Brian has been the NBIS program manager since September of 2018, prior to becoming the NBIS program manager, Brian was the Bridge Inspection Program Manager for several months. Brian also has several years of experience with the safety inspection of in-service bridges and data management/collection.

Allie Nadjarian (resume/certifications attached) holds a Bachelors (CY 2012) of Science in Engineering from Michigan State University). Allie is a Professional Engineer (License Number 6201064877) in the State of Michigan and is the Bridge Inspection Program Manager for MDOT. Allie has completed the comprehensive bridge inspection training course required by the NBIS and the periodic bridge inspection refresher training in accordance with MDOT's policy. Allie has been the Bridge Inspection Program Manager since September 2018, prior to becoming the Bridge Inspection Program Manager as was a load rating staff engineer with the MDOT and was responsible for performing and reviewing load ratings for new and rehabilitated structures, in addition to her load rating responsibilities Allie participated in several in-service inspections of fracture critical structures to collect condition information for the refined analysis of critical members. Allie was able to gain significant inspection/bridge management experience through cross-training opportunities with MDOT.

Interview questions/responses are as follows:

What authority do you have to resolve safety related bridge issues and ensure NBIP compliance for functions delegated to bridge owners with regards to: overdue inspections, posting, closing of a bridge deemed unsafe?

*To ensure NBIP compliance and that proper action is taken by local agency bridge owners, MDOT has the authority to withhold Act 51 funding if a local agency fails to perform inspections and/or report bridge condition as required. Funding is withheld until the local agency comes into compliance.*

How do you keep bridge owners aware of NBIP requirements and changes to MDOT inspection policies? What is the notification frequency?

*NBIP requirements and changes to MDOT inspection policy are relayed to bridge owners as well as consultants primarily through Bridge Advisories and updates to the Michigan Structure Inspection Manual. In addition, an MDOT representative attends CRA and MML meetings to provide information regarding upcoming changes. Notifications are provided on an as-needed basis for the majority of inspection and load rating requirements. Monthly notifications are sent to individual agencies regarding a variety of compliance measures that have been incorporated into the Michigan Bridge Inspection Program.*

How are findings from MDOT QA reviews documented? Are recommendations for improvement identified and disseminated? How does MDOT ensure corrective actions are completed?

*QA reviews are documented on a weekly basis and summarized through an annual report that compiles information from the agency reviews with an analysis of the findings and recommendations for improvement. If substantial issues arise, a memorandum is provided. MDOT follows up with agencies on an as-needed basis through meetings or by increasing the frequency for additional QA activities during subsequent years.*

Does MDOT conduct calibration training for NBI/Element condition assessment as part of MDOT bridge inspection refresher training?

*MDOT has conducted calibration training in the past in both large group settings as well as on an individual basis. Three field calibration meetings are tentatively scheduled for 2019.*

What is MDOTs bridge inspection program greatest strength? Weakness?

*The greatest strength of the MDOT bridge inspection program is the extensive knowledge and resources that exist within MDOT at both the central office and region level, as well as through a variety of consultants. The greatest weakness of the bridge inspection program is the delegation of inspection responsibilities to local agencies throughout the state, which are often managed by individuals without an engineering background.*

What program changes are planned for the future?

*MDOT is committed to continually improving NBIS compliance by improving and strengthening QAQC statewide, and by intensifying the standards that we hold our inspectors and load rating engineers to. In addition, bridge inspection in the region will be reinforced by adding Assistant Region Bridge Engineer positions.*

**Findings:**

None for this Section.

**Conclusions:**

Compliant. MDOT Program Managers have the required qualifications and have completed periodic bridge inspection refresher training according to MDOT policy.

This determination was based on the Divisions review of the National Bridge Inspection Standards for program managers (23 CFR §650.309 (a) ), the National Bridge Inspection Program Compliance Criteria for Metric 2, and the program managers knowledge and awareness of the States bridge inspection program.

**Recommendations:**

None for this Section.

## Metric Number: 03 – Qualifications of Personnel – Team Leader(s)

Assessment Level: Minimum

### Metric Summary

#### **Extent of Review:**

This Metric was assessed based on the results of the qualification reviews, previous review results and on the reviewer's knowledge and awareness of the State's Bridge Inspection Program. Qualification reviews were performed on randomly sampled and field review sampled Team Leaders to verify Team Leaders have the required NBIS/MDOT qualifications/certifications.

Team Leader qualifications for non-professional engineers and professional engineers with exemptions were verified with supplemental documentation (FHWA Questionnaire, Supervisor/Program Manger Attested Experience Resume).

In-depth assessment performed in PY2016.

#### **Observations:**

Documentation Review:

The Bridge Owner is required to maintain the Team Leaders credentials to assure compliance with the National Bridge Inspection Standards. This manual verification process is extremely time consuming, cumbersome and prone to errors. In the future this verification process will be automated (requirement of the improvement plan) to ensure accurate and timely reporting.

The automated verification process will launch with a new version of the MiBridge web-based structure management application in 2019/2020. The 2019/2020 launch is dependent on the following:

- The development of an interface which allows MiBridge access to the Michigan Professional Engineers Database (Department of Management and Budget and the Department of Licensing and Regulatory Affairs).
- The approval of MiBridge forms (Chief Data Steward).

Qualification verification is determined by reviewing certifications for training completed within the five years prior to the month the Team Leader completed the inspection. Team Leaders are allowed a grace period of 6 months from when their qualifications have expired to complete the necessary recurrent training requirements (MSIM 1.05.02). Structures inspected during this grace period must have fifty percent of the file reports reviewed and 25 percent of the field inspections reviewed. The file and field reviews must be performed by an independent team leader.

Randomly Sampled Team Leader Review:

Team Leaders were randomly sampled (80 percent level of confidence, 15 percent margin of error) to assure compliance with the NBIS and MSIM education/training/experience requirements. No compliance deficiencies were noted with the randomly sampled team leaders.

#### Field Review Sampled Team Leader Review:

Inspection reports from sampled structures were evaluated to assure a qualified team leader was present at each applicable inspection. This evaluation found that one of the sampled structures did not have a qualified team leader present at each applicable inspection. Sampled structure/Inspector information is as follows:

SN 01997 (Kinley Road over Peet Creek): Frank Brechting failed to complete the periodic bridge inspection refresher training per State policy (MSIM). Mr. Brechting was lapsed from March 15th, 2017 until September 1st, 2018. Structures inspected during this period by Mr. Brechting must have fifty percent of the file reports reviewed and 25 percent of the field inspections reviewed by an independent Team Leader.

#### **Findings:**

Not all team leaders have completed periodic bridge inspection refresher training according to state policy.

#### **Conclusions:**

Substantially Compliant. Not all team leaders have completed periodic bridge inspection refresher training according to state policy.

This assessment is based on the Divisions review of the National Bridge Inspection Standards for team leaders (23 CFR §650.309 (b) and 23 CFR §650.313 (g) ), the National Bridge Inspection Program Compliance Criteria, the State specific recurrent training requirements, the progression of the IP, the qualification review results, previous review results and the reviewer's knowledge and awareness of the State's Bridge Inspection Program.

#### **Recommendations:**

MDOT must contact responsible agencies to address any deficiencies noted during the NBIP review and develop an improvement plan to ensure future compliance with the NBIS/NBIP requirements. The improvement plan should include the manual verification of Team Leader qualifications until the automated verification process is implemented in 2019/2020, manual verification should be the responsibility of the bridge owner. The improvement plan should also include inspector re-current training, and de-certification/re-certification.

## **Metric Number: 04 – Qualifications of Personnel – Load Rating Engineer**

Assessment Level: Minimum

### **Metric Summary**

#### ***Extent of Review:***

Metric was assessed based on previous review results, and on the reviewers knowledge and awareness of the Load Rating Engineers qualifications and responsibilities.

Intermediate assessment performed in PY2015.

#### ***Observations:***

This metric was reviewed at the intermediate level in 2015. The intermediate level review confirmed that the Load Rating Engineer (Creightyn McMunn) has satisfactorily completed the requirements set forth by the NBIS and the Michigan Department of Transportation.

Creightyn holds a Bachelors (CY 2000)/Masters (CY 2001) of Science in Engineering from the University of Michigan. Creightyn is a Licensed Professional Engineer in the State of Michigan (License Number 6201053937) and has been the Load Rating Engineer for the Michigan Department of Transportation since September of 2013.

#### ***Findings:***

None for this section.

#### ***Conclusions:***

Compliant. This determination was based on the Divisions review of the National Bridge Inspection Standards for load rating engineers (23 CFR §650.309 (c)), the National Bridge Inspection Program Compliance Criteria for Metric 4, previous review results and the reviewer's knowledge and awareness of the Load Rating Engineers qualifications/responsibilities.

#### ***Recommendations:***

None for this section.



## Metric Number: 05 – Qualifications of Personnel – UW Bridge Inspection Diver

Assessment Level: Minimum

### Metric Summary

#### **Extent of Review:**

This Metric was assessed based on the results of the qualification reviews, previous review results and on the reviewer's knowledge and awareness of the State's Bridge Inspection Program. Qualification reviews were performed on sampled Underwater Divers to verify successful completion of either the FHWA approved comprehensive bridge inspection training course or the underwater bridge inspection training course.

Intermediate assessment performed in PY2015.

#### **Observations:**

##### Documentation Review:

Thirteen underwater divers were listed as having performed underwater inspections during the NBI data collection period. The division reviewed the qualifications (training certificates) of seven of the thirteen divers, the other six divers were reviewed in previous years.

During the divisions review it was determined that one of the seven divers (one of the thirteen divers) was incorrectly listed as having performed an underwater inspection during the NBI data collection period, the individual listed performed a special scour inspection as a qualified team leader (Chad Skrocki) to document/monitor scour. The underwater inspection was performed by a qualified underwater bridge inspector (Casey Collings - Great Lakes Engineering) in 2015.

The divisions review found that all sampled underwater bridge inspector divers who completed underwater inspections during the NBI data collection period completed either the FHWA approved comprehensive bridge inspection training course or the underwater bridge inspection training course (see attached spreadsheet).

##### Field and File Review:

No Underwater Diver compliance deficiencies were noted during the file/field reviews for the metrics which were assessed at the intermediate level (Metric 15 (Inspection Procedures - Bridge File), Metric 17 (Inspection Procedures - Underwater), and Metric 19 (Inspection Procedures - Complex Bridges).

#### **Findings:**

None for this section.

#### **Conclusions:**

Compliant. This assessment is based on the Divisions review of the National Bridge Inspection Standards for underwater divers(23 CFR §650.309 (d)), the National Bridge Inspection Program Compliance Criteria, the qualification review results, previous review results and the reviewer's knowledge and awareness of the State's Bridge Inspection Program.

#### **Recommendations:**

None for this section.

## Metric Number: 06 – Inspection Frequency – Routine – Lower Risk Bridges

Assessment Level: Minimum

### Metric Summary

#### **Extent of Review:**

This Metric was assessed based on a review of the results of Metric Assessment Report (MAR) for Metric 6, previous review results, and on the reviewer's knowledge and awareness of the State's Bridge Inspection Program.

Intermediate assessment performed in PY2017.

#### **Observations:**

Documentation Review:

MDOT/Division continues to assess the effectiveness of enhanced notifications procedures implemented with the improvement plan from PY17. Enhanced procedures are as follows:

- MDOT Bureau of Bridges and Structures will continue generate a list of agencies with unassigned inspections one month prior than the month they are due and notify the bridge owners and all vendors registered with MiBRIDGE. MDOT enhanced this notification by including MDOT's TSC Managers.
- MDOT Bureau of Bridges and Structures will continue to contact the agencies with inspections that are one month past due and provide notification that non-compliance proceedings will occur during the subsequent month if corrective action is not taken. MDOT enhanced this notification to include MDOT's TSC Managers.

For inspections greater than two months past due MDOT provides bridge owners with notification of non-compliance with the National Bridge Inspection Standards. This notification may result in the following:

- MDOT of State/Federal funding until corrective actions have been implemented.
- MDOT providing supplemental inspection assistance.

The state requires justifiable cause for inspection intervals exceeding the required not to exceed interval. Requirements are as follows:

- If an inspection cannot be completed as schedule the bridge owner must notify the Bureau of Bridges and structures with the cause of delay.
- The team leader must document the cause of delay on the inspection report in the States web based structure management system (MiBridge)

#### MAR Review:

The MAR was reviewed at the minimum assessment level to resolve overdue inspections (no overdue inspections noted in 2018) and for comparison of the MAR summary tab percentages inspected within each threshold to the previous years levels. See below for summary tab percentage comparison:

#### Summary Tab Percentage Comparison:

- The number of inspections performed within the required not to exceed inspection interval was 98.89 percent (4275 of 4323) in performance year 2018, up from 95.96 percent (4180 of 4356) in performance year 2017.
- The number of inspections performed within one month of the required not to exceed inspection interval was 99.45 percent (4299 of 4323) in performance year 2018, up from 98.60 percent (4295 of 4356) in performance year 2017.
- The number of inspections performed within four months of the not to exceed inspection interval was 100.00 percent (4323 of 4323) in performance year 2018, up from 99.33 percent (4327 of 4356) in performance year 2017.

The positive trends are not an indication that compliance will continue to improve, but they are an indication that the enhanced notification procedures/continuing education has increased awareness of the inspection frequency requirements set forth in the NBIS/NBIP.

#### **Findings:**

The MAR for metric 6 revealed there were no overdue inspections, that 98.89 percent of inspections were performed within the required not to exceed interval, that 99.45 percent of inspections were performed within one month of the required not to exceed inspection interval, and that 100.00 percent of inspections were performed within four months of the not to exceed inspection interval.

#### **Conclusions:**

Substantially compliant, all bridges were not inspected within the required not to exceed interval. This determination was based on the Divisions review of the National Bridge Inspection Standards for inspection frequency (23 CFR §650.311 (a)), the National Bridge Inspection Program Compliance Criteria for Metric 6, the MAR results and the reviewer's knowledge and awareness of the State's Bridge Inspection Program.

#### **Recommendations:**

Continue to monitor the effectiveness of the enhanced procedures implemented with the improvement plan from PY17.

## Metric Number: 07 – Inspection Frequency – Routine – Higher Risk Bridges

Assessment Level: Minimum

### Metric Summary

#### **Extent of Review:**

This Metric was assessed based on a review of the results of Metric Assessment Report (MAR) for Metric 7, previous review results, and on the reviewer's knowledge and awareness of the State's Bridge Inspection Program.

Intermediate assessment performed in PY2017.

#### **Observations:**

Documentation Review:

MDOT/Division continues to assess the effectiveness of enhanced notifications procedures implemented with the improvement plan from PY17. Enhanced procedures are as follows:

- MDOT Bureau of Bridges and Structures will continue generate a list of agencies with unassigned inspections one month prior than the month they are due and notify the bridge owners and all vendors registered with MiBRIDGE. MDOT enhanced this notification by including MDOT's TSC Managers.
- MDOT Bureau of Bridges and Structures will continue to contact the agencies with inspections that are one month past due and provide notification that non-compliance proceedings will occur during the subsequent month if corrective action is not taken. MDOT enhanced this notification to include MDOT's TSC Managers.

For inspections greater than two months past due MDOT provides bridge owners with notification of non-compliance with the National Bridge Inspection Standards. This notification may result in the following:

- MDOT of State/Federal funding until corrective actions have been implemented.
- MDOT providing supplemental inspection assistance.

The state requires justifiable cause for inspection intervals exceeding the required not to exceed interval. Requirements are as follows:

- If an inspection cannot be completed as schedule the bridge owner must notify the Bureau of Bridges and structures with the cause of delay.
- The team leader must document the cause of delay on the inspection report in the States web based structure management system (MiBridge)

## MAR Review:

The MAR was reviewed at the minimum assessment level to resolve overdue inspections (no overdue inspections noted in 2018) and for comparison of the MAR summary tab percentages inspected within each threshold to the previous years levels. See below for summary tab percentage comparison:

### Summary Tab Percentage Comparison:

- The number of inspections performed within the required not to exceed inspection interval was 98.46 percent (1605 of 1630) in performance year 2018, up from 96.77 percent (1590 of 1643) in performance year 2017.
- The number of inspections performed within one month of the required not to exceed inspection interval was 99.02 percent (1614 of 1630) in performance year 2018 , up from 97.87 percent (1608 of 1643) in performance year 2017.
- The number of inspections performed within four months of the not to exceed inspection interval was 100.00 percent (1630 of 1630) in performance year 2018, up from 98.78 percent (1623 of 1643) in performance year 2017.

The positive trends are not an indication that compliance will continue to improve, but they are an indication that the enhanced notification procedures/continuing education has increased awareness of the inspection frequency requirements set forth in the NBIS/NBIP.

### **Findings:**

The MAR for metric 7 revealed there were no overdue inspections, that 98.46 percent of inspections were performed within the required not to exceed interval, that 99.02 percent of inspections were performed within one month of the required not to exceed inspection interval, and that 100.00 percent of inspections were performed within four months of the not to exceed inspection interval.

### **Conclusions:**

Substantially Compliant - All bridges were not inspected within the required not to exceed interval.

This determination was based on the Divisions review of the National Bridge Inspection Standards for inspection frequency (23 CFR §650.311 (a)), the National Bridge Inspection Program Compliance Criteria for Metric 7, the MAR results and the reviewer's knowledge and awareness of the State's Bridge Inspection Program.

### **Recommendations:**

Continue to monitor the effectiveness of the enhanced procedures implemented with the improvement plan from PY17.

## Metric Number: 08 – Inspection Frequency – Underwater – Lower Risk Bridges

Assessment Level: Minimum

### Metric Summary

#### **Extent of Review:**

This Metric was assessed based on the results of Metric Assessment Report (MAR) for Metric 8, previous review results, and on the reviewer's knowledge and awareness of the State's Bridge Inspection Program.

Intermediate assessment performed in PY2018.

#### **Observations:**

Documentation Review:

MDOT/Division continues to assess the effectiveness of enhanced notifications procedures implemented with the improvement plan from PY17. Enhanced procedures are as follows:

- MDOT Bureau of Bridges and Structures will continue generate a list of agencies with unassigned inspections one month prior than the month they are due and notify the bridge owners and all vendors registered with MiBRIDGE. MDOT enhanced this notification by including MDOT's TSC Managers.
- MDOT Bureau of Bridges and Structures will continue to contact the agencies with inspections that are one month past due and provide notification that non-compliance proceedings will occur during the subsequent month if corrective action is not taken. MDOT enhanced this notification to include MDOT's TSC Managers.

For inspections greater than two months past due MDOT provides bridge owners with notification of non-compliance with the National Bridge Inspection Standards. This notification may result in the following:

- MDOT of State/Federal funding until corrective actions have been implemented.
- MDOT providing supplemental inspection assistance.

The state requires justifiable cause for inspection intervals exceeding the required not to exceed interval. Requirements are as follows:

- If an inspection cannot be completed as schedule the bridge owner must notify the Bureau of Bridges and structures with the cause of delay.
- The team leader must document the cause of delay on the inspection report in the States web based structure management system (MiBridge)

## MAR Review:

The MAR was reviewed at the minimum assessment level to resolve overdue inspections (no overdue inspections noted in 2018) and for comparison of the MAR summary tab percentages inspected within each threshold to the previous years levels. See below for summary tab percentage comparison:

### Summary Tab Percentage Comparison:

- The number of inspections performed within the required not to exceed inspection interval was 98.02 percent (59 of 60) in performance year 2018 , down from 100 percent (18 of 18) in performance year 2017.
- The number of inspections performed within one month of the not to exceed inspection interval was 100.00 percent in both performance year 2017 and 2018.

Annual tab percentages are influenced by several factors (human, environmental), small variations are not an indication that compliance will decline/increase.

### **Findings:**

None for this section.

### **Conclusions:**

Compliant. All underwater inspections were performed within the required not exceed interval or were inspected within one month of the not to exceed interval. Justifiable cause was provided for underwater inspections that required an additional month.

This determination was based on the Divisions review of the National Bridge Inspection Standards for inspection frequency (23 CFR §650.311 (b)), the National Bridge Inspection Program Compliance Criteria for Metric 8, the MAR results and the reviewer's knowledge and awareness of the State's Bridge Inspection Program

### **Recommendations:**

None for this section.

## Metric Number: 09 – Inspection Frequency – Underwater – Higher Risk Bridges

Assessment Level: Minimum

### Metric Summary

#### **Extent of Review:**

This Metric was assessed based on the results of Metric Assessment Report (MAR) for Metric 9, previous review results, and on the reviewer's knowledge and awareness of the State's Bridge Inspection Program.

Intermediate assessment performed in PY2018.

#### **Observations:**

Documentation Review:

MDOT/Division continues to assess the effectiveness of enhanced notifications procedures implemented with the improvement plan from PY17. Enhanced procedures are as follows:

- MDOT Bureau of Bridges and Structures will continue generate a list of agencies with unassigned inspections one month prior than the month they are due and notify the bridge owners and all vendors registered with MiBRIDGE. MDOT enhanced this notification by including MDOT's TSC Managers.
- MDOT Bureau of Bridges and Structures will continue to contact the agencies with inspections that are one month past due and provide notification that non-compliance proceedings will occur during the subsequent month if corrective action is not taken. MDOT enhanced this notification to include MDOT's TSC Managers.

For inspections greater than two months past due MDOT provides bridge owners with notification of non-compliance with the National Bridge Inspection Standards. This notification may result in the following:

- MDOT of State/Federal funding until corrective actions have been implemented.
- MDOT providing supplemental inspection assistance.

The state requires justifiable cause for inspection intervals exceeding the required not to exceed interval. Requirements are as follows:

- If an inspection cannot be completed as schedule the bridge owner must notify the Bureau of Bridges and structures with the cause of delay.
- The team leader must document the cause of delay on the inspection report in the States web based structure management system (MiBridge)



#### MAR Review:

The MAR was reviewed at the minimum assessment level to resolve overdue inspections (one overdue inspection identified/reviewed/resolved) and for comparison of the MAR summary tab percentages inspected within each threshold to the previous years levels. See below for overdue inspection resolution and summary tab percentage comparison:

#### Overdue Inspection Resolution:

The MAR identified one overdue underwater inspection (Structure Number 10413 (M-46 over Cass River)). Water levels at this structure were monitored during routine inspections. The inspections noted that water levels were consistently less than three feet, therefore the structure does not require an underwater diver inspection and may be inspected through other means (wade and probe/boat and probe). The coding for Structure Inventory and Appraisal Item 92B has been changed from Y60 to N.

#### Summary Tab Percentage Comparison:

- The number of inspections performed within the not to exceed inspection interval was 100.00 percent in both performance year 2017 and 2018.

#### **Findings:**

None for this section.

#### **Conclusions:**

Compliant. All underwater inspections were performed within the required not exceed interval.

This determination was based on the Divisions review of the National Bridge Inspection Standards for inspection frequency (23 CFR §650.311 (b)), the National Bridge Inspection Program Compliance Criteria for Metric 9, the MAR results and the reviewer's knowledge and awareness of the State's Bridge Inspection Program

#### **Recommendations:**

None for this section.

## Metric Number: 10 – Inspection Frequency – Fracture Critical Member

Assessment Level: Minimum

### Metric Summary

#### **Extent of Review:**

This Metric was assessed based on the results of Metric Assessment Report (MAR) for Metric 10, previous review results, and on the reviewer's knowledge and awareness of the State's Bridge Inspection Program.

Intermediate assessment performed in PY2017.

#### **Observations:**

Documentation Review:

MDOT/Division continues to assess the effectiveness of enhanced notifications procedures implemented with the improvement plan from PY17. Enhanced procedures are as follows:

- MDOT Bureau of Bridges and Structures will continue generate a list of agencies with unassigned inspections one month prior than the month they are due and notify the bridge owners and all vendors registered with MiBRIDGE. MDOT enhanced this notification by including MDOT's TSC Managers.
- MDOT Bureau of Bridges and Structures will continue to contact the agencies with inspections that are one month past due and provide notification that non-compliance proceedings will occur during the subsequent month if corrective action is not taken. MDOT enhanced this notification to include MDOT's TSC Managers.

For inspections greater than two months past due MDOT provides bridge owners with notification of non-compliance with the National Bridge Inspection Standards. This notification may result in the following:

- MDOT of State/Federal funding until corrective actions have been implemented.
- MDOT providing supplemental inspection assistance.

The state requires justifiable cause for inspection intervals exceeding the required not to exceed interval. Requirements are as follows:

- If an inspection cannot be completed as schedule the bridge owner must notify the Bureau of Bridges and structures with the cause of delay.
- The team leader must document the cause of delay on the inspection report in the States web based structure management system (MiBridge)

## MAR Review:

The MAR was reviewed at the minimum assessment level to resolve overdue inspections (no overdue inspections noted in 2018) and for comparison of the MAR summary tab percentages inspected within each threshold to the previous years levels. See below for summary tab percentage comparison:

### Summary Tab Percentage Comparison:

- The number of inspections performed within the required not to exceed inspection interval was 97.72 percent (86 of 88) in performance year 2018 , up from 96.51 percent (83 of 86) in performance year 2017.
- The number of inspections performed within one month of the not to exceed inspection interval was 100.00 percent (88 of 88) in performance year 2018, up from 98.84 percent (85 of 86) in performance year 2017.

Annual tab percentages are influenced by several factors (human, environmental), small variations are not an indication that compliance will decline/increase.

### ***Findings:***

None for this section.

### ***Conclusions:***

Compliant. All fracture critical inspections were performed within the required not exceed interval or were inspected within one month of the not to exceed interval. Justifiable cause was provided for fracture critical inspections that required an additional month.

This determination was based on the Divisions review of the National Bridge Inspection Standards for inspection frequency (23 CFR §650.311 (c)), the National Bridge Inspection Program Compliance Criteria for Metric 10, the MAR results and the reviewer's knowledge and awareness of the State's Bridge Inspection Program.

### ***Recommendations:***

None for this section.

## Metric Number: 11 – Inspection Frequency – Frequency Criteria

Assessment Level: Minimum

### Metric Summary

#### **Extent of Review:**

This Metric was assessed based on a random review/resolution of the Metric Assessment Report (MAR) for Metric 11, previous review results, and on the reviewer's knowledge and awareness of the State's Bridge Inspection Program.

Intermediate assessment performed in PY2017.

#### **Observations:**

Documentation Review:

MDOT developed the Michigan Structure Inspection Manual (MSIM) and the NBIS Bridge Owners Guide to provide guidance and clarification for inspection of structures. The MSIM adequately describes the requirements and procedures to ensure inspection frequency and timeliness in accordance with the NBIS.

In addition, MDOT issued the following bridge advisories for bridge inspection frequency:

- BA-2013-01 Guidelines for Bridge Inspection Frequencies
- BA-2014-02 Michigan Structure Inspection Manual Updates
- BA-2014-03 MiBridge Inspection Report Submission and Unassigned Bridges

MDOT/Division continues to assess the effectiveness of enhanced notifications procedures implemented with the improvement plan from PY17. Enhanced procedures are as follows:

- MDOT Bureau of Bridges and Structures will continue generate a list of agencies with unassigned inspections one month prior than the month they are due and notify the bridge owners and all vendors registered with MiBRIDGE. MDOT enhanced this notification by including MDOT's TSC Managers.
- MDOT Bureau of Bridges and Structures will continue to contact the agencies with inspections that are one month past due and provide notification that non-compliance proceedings will occur during the subsequent month if corrective action is not taken. MDOT enhanced this notification to include MDOT's TSC Managers.

For inspections greater than two months past due MDOT provides bridge owners with notification of non-compliance with the National Bridge Inspection Standards. This notification may result in the following:

- MDOT of State/Federal funding until corrective actions have been implemented.
- MDOT providing supplemental inspection assistance.

The state requires justifiable cause for inspection intervals exceeding the required not to exceed interval. Requirements are as follows:

- If an inspection cannot be completed as schedule the bridge owner must notify the Bureau of Bridges and structures with the cause of delay.
- The team leader must document the cause of delay on the inspection report in the States web based structure management system (MiBridge)

MAR Review:

The MAR was reviewed at the minimum assessment level to assure structures were inspected within their not to exceed inspection interval and per established frequency criteria. The MAR summary was reviewed for indication of new deficiencies and the MAR results were randomly sampled (90 percent level of confidence, 10 percent margin of error) to assure compliance. Ten of the sixty-four randomly sampled structures had possible compliance deficiencies, these deficiencies were reviewed and resolved. See below for a summary of resolved deficiencies:

- SN 00204: Reduced interval inspections meet +1 month. Structure inspected on 11/16, 05/17, 11/17 and 05/18. Structure remains on 6-month interval to monitor structure condition.
- SN 02321: Reduced interval inspections meet + 1 month. Structure inspected on 08/16 and 07/17. Detailed inspection was performed on 8/16, structure was placed on 11-month interval on 8/16 to return to original schedule.
- SN 02968: Reduced interval inspections meet + 1 month. Structure inspected on 11/16, 7/17 and 4/18. Structure remains on 9-month interval to monitor structure condition.
- SN 03805: Reduced interval inspections meet + 1 month. Structure inspected on 08/16, 08/17 and 08/18, special inspections performed on 11/16, 05/17, 11/17 and 05/18 to monitor structure (beam end cracking).
- SN 03839: Reduced interval inspections meet + 1 month. Structure inspected on 09/15, 09/16 and 09/17, special inspections performed on 11/16, 05/17, 11/17 and 05/18. Structure remains on reduced interval inspection (Routine/Special) to monitor structure condition.
- SN 04347: Reduced interval inspections meet + 1 month. Structure inspected on 05/17, 10/17, 04/18 and 10/18. Structure remains on 6-month interval to monitor structure condition.
- SN 05345: Reduced interval inspections meet + 1 month. Structure inspected on 11/16 and 4/17. Structure returned to 24-month interval following the 4/17 inspection, structure was placed on 5-month interval on 11/16 to return to original schedule.
- SN 05751: Reduced interval inspections meet + 1 month. Special inspections were performed on 08/16, 02/17 and 08/17 to monitor structure until repairs were completed. Following the repair Structural Inventory and Appraisal Item 92C was changed from Y06 to N.
- SN 05935: Reduced interval inspections meet + 1 month. Special inspections were performed on 11/16 and 05/17 to monitor structure until repairs were completed. Following the repair Structural Inventory and Appraisal Item 92C was changed from Y06 to N.
- SN 12197: Reduced interval inspections meet + 1 month. Structure inspected on 01/16, 10/16 and 6/17. Structure returned to 24-month interval following the 6/17 inspection.

***Findings:***

None for this section.

***Conclusions:***

Compliant. Bridges are being inspected based on established level of inspection and frequency criteria for routine, fracture critical, underwater, damage, in-depth and special inspections.

This determination was based on the Divisions review of the National Bridge Inspection Standards for inspection frequency (23 CFR §650.311 (a, b, c, d)), the National Bridge Inspection Program Compliance Criteria for Metric 11, the MAR results and the reviewer's knowledge and awareness of the State's Bridge Inspection Program.

***Recommendations:***

None for this section.

## Metric Number: 12 – Inspection Procedures – Quality Inspections

Assessment Level: Minimum

### Metric Summary

#### **Extent of Review:**

This Metric was assessed based on the results of the field reviews and on the reviewer's knowledge and awareness of the State's Bridge Inspection Program. Field reviews were performed to compare actual bridge conditions with data provided on the inspection reports to evaluate the following items:

- Accuracy of component condition codes
- Adequacy of documentation and appropriate justification of component condition codes
- Use of proper inspection procedures (General/Bridge Specific)
- Indication that a qualified team leader was present at each applicable inspection

Intermediate assessment performed in PY2018.

#### **Observations:**

Documentation Review:

MDOT developed the Michigan Structure Inspection Manual (MSIM) to provide guidance/clarification for the inspection of Bridges, reinforce the policies/procedures of MDOT and the FHWA, ensure statewide consistency and improve compliance with the National Bridge Inspection Standards. The MSIM is updated periodically to document revised/new policies.

Field Review:

Field reviews were conducted on a systematic random sample of structure inspections performed during the previous calendar year to assure all structure inspections were conducted by qualified team leaders, used proper procedures, included all appropriate inspection types and resulted in accurate condition codes and fully documented deficiencies. The systematic random sample provides the Division with a degree of control and sense of the process, and ensures an evenly sampled population. The minimum recommended sample size was nineteen, twenty structures were selected for review.

Field reviews were coordinated with the State Program Manager. If schedules permitted the State program manager or other applicable inspection staff participated in the field reviews. Field reviews were not coordinated with the Team leaders of sampled bridge inspections.

Field review observations are as follows:

*Condition Codes:* Condition assessments were within generally acceptable tolerances (NBI condition code within one value of the Field Review code) for nineteen of the twenty structures. Compliance deficiency noted below:

SN 02742 – Item 58 (Deck) NBI condition code was 5, Field Review condition code was 1. Per the BIRM the top flange of adjacent box beams functions as the deck where non-structural overlays are applied and not considered composite. Item 59 (Superstructure) coding justification notes significant deterioration of the top flanges of the adjacent box beams, this deterioration was not reflected in the coding of Item 58.

*Identification of Deficiencies:* Deficiencies were fully documented for nineteen of the twenty structures. Compliance deficiency noted below:

SN 06871 – Item 59 (Superstructure) justification excluded the visible deficiencies (vertical cracking, map cracking, heavy efflorescence).

*Narrative Justifies Condition Rating:* Condition ratings were justified for eighteen of the twenty structures. Compliance deficiencies noted below:

SN 01655 – Narrative was not provided for Item 58 (Deck), Item 59 (Superstructure) or Item 60 (Substructure).

SN 05651 – Item 60 (Substructure) condition code could not be justified based on narrative provided.

*Qualified Team Leader/Qualified Underwater Inspector Present:* Qualified team leaders/underwater inspectors were present on all applicable inspections for nineteen of the twenty structures. This compliance deficiency was identified under Metric 3 (Qualifications of Personnel – Team Leader(s)), therefore this issue affects the compliance of Metric 3 and not Metric 12 (Inspection Procedures -Quality Inspections). Compliance deficiency noted below:

SN 01997 – (Kinley Road over Peet Creek): Frank Brechting failed to complete the periodic bridge inspection refresher training per State policy (MSIM). Mr. Brechting was lapsed from March 15th, 2017 until September 1st, 2018. Structures inspected during this period by Mr. Brechting must have fifty percent of the file reports reviewed and 25 percent of the field inspections reviewed by an independent Team Leader.

*Applicable Inspection Types/Procedures:* Proper inspection types were utilized on all sampled structures and all structures were inspected in accordance with the proper procedures (MBE, Bridge Specific, State Specific).

**Findings:**

Review of the systematic random sample found one structure inspection did not meet the criteria for component condition ratings, one structure inspection excluded notable deficiencies which lead to an NBI rating of 5 or less, and two structure inspections failed to provide a narrative to justify condition ratings. Overall eighty percent of the bridges reviewed met the criteria for component condition ratings and documentation of deficiencies.

**Conclusions:**

Substantially Compliant. Eighty percent of bridges reviewed met the criteria for component condition ratings or documentation of deficiencies.

This determination was based on the Divisions review of the National Bridge Inspection Standards for inspection quality (23 CFR §650.313 (a and b)), the National Bridge Inspection Program Compliance Criteria, the field review results and the reviewer’s knowledge and awareness of the State’s Bridge Inspection Program.

**Recommendations:**

MDOT must contact responsible agencies to address any deficiencies noted during the NBIP review and develop an improvement plan to ensure future compliance with the NBIS/NBIP requirements. The improvement plan should include improved quality control measures/methods to assure accurate data acquisition, coding and reporting.



## Metric Number: 13 – Inspection Procedures – Load Rating

Assessment Level: Minimum

### Metric Summary

#### **Extent of Review:**

This Metric was assessed based on the progression of the Plan of Corrective Action (PCA), results of Metric Assessment Report (MAR) for Metric 13, previous review results, and on the reviewer's knowledge and awareness of the State's Bridge Inspection Program.

Intermediate assessment performed in PY2018.

#### **Observations:**

Documentation Review:

Metric 13 (Inspection Procedures – Load Rating) is under an active plan of corrective action (PCA). The PCA requires MDOT to implement the following corrective actions:

- 13-1 (PCA Completion - October 1st, 2018): MDOT must send a notification to all local bridge owners clarifying their roles and responsibilities.
  - Local Bridge Owners Guide Posted on September 28th, 2018 to provide bridge owners a high-level overview of the requirements set forth in the NBIS.
- 13-2 (PCA Completion - November 30th, 2020): MDOT must develop a comprehensive QA/QC program for local agency load ratings. The program shall provide routine, independent, and consistent QC checks on a minimum of twenty percent of local agencies each year and a minimum of ten percent of the local agency's bridge inventory to verify the availability and accuracy of local agency load rating data. This program will be administered in conjunction with the MDOT Bridge Inspection QA/QC contract.
  - MDOT contracted with Great Lakes Engineering Group (Load Rating Sub-consultant: Tetra Tech) and Spicer Group (Load Rating Sub-consultant: Bergmann) to perform local agency QA/QC of load ratings and inspections. Each year, the QA/QC program will review an MDOT region or regions (2018 Review – North/University Regions), visiting one hundred percent of agencies within the region(s) and reviewing ten percent of each agency's inventory. The consultants will review the load ratings for accuracy of calculations and proper application of load rating theory, as well as for completeness of the load rating documentation, including proof of load posting when applicable.
- 13-3 (PCA Completion - July 31st, 2020): MDOT will develop and implement additional data checks in MiBridge to improve the accuracy of NBI load rating data.
  - MiBridge was updated to limit data entry for Item 141 to 42T or less for GVW postings & 10T or less for axle weight postings. MDOT is in the process of reviewing the NBIP Metrics, the Metric Assessment Reports for Metrics 13/14, and other applicable FHWA guidance to develop additional data checks for MiBridge.

#### MAR Review:

The MAR identified one structure with a potential compliance deficiency. The compliance deficiency was reviewed and resolved (resolution not required).

SN 14032 - Structure was added to the Houghton County Bridge Inventory in October of 2017. Load rating data was updated in June/July of 2018. Houghton County exceeded the allowable interval of 180 days to review and update their bridge inventory.

#### File Review (Metric 15 Inspection Procedures - Bridge Files):

The intermediate assessment of Metric 15 (Inspection Procedures - Bridge Files) identified two Metric 13 compliance deficiencies. Compliance deficiencies noted below:

SN 02788: Load rating documentation incomplete. Federal operating/inventory evaluation missing. Load rating was updated following NBIP review.

SN 08321: Load rating unavailable. Bridge file unavailable.

#### Field Review (Metric 22 Inventory - Prepare and Maintain):

The intermediate assessment of Metric 22 (Inventory - Prepare and Maintain) identified five compliance deficiencies that may impact load ratings. Compliance deficiencies noted below:

SN 00023: Item 108A (Type of Wearing Surface) was not coded for chip seal.

SN 02807: Item 108A (Type of Wearing Surface) was not coded for bituminous overlay.

SN 04496: Item 106 (Year Reconstructed) was not coded for reconstruction/widening.

SN 07022: Item 27 (Year Built) was incorrectly coded for year of reconstruction in 1988, structure was built in 1932.

SN 07022: Item 106 (Year Reconstructed) was not coded for reconstruction in 1988.

#### **Findings:**

MDOT is adhering to an FHWA approved plan of corrective action (PCA). No indication of new /unknown compliance deficiencies noted.

#### **Conclusions:**

Conditionally Compliant. MDOT is adhering to an FHWA approved plan of corrective action (PCA).

This determination was based on the Divisions review of the National Bridge Inspection Standards for load rating (23 CFR §650.313 (c)), the National Bridge Inspection Program Compliance Criteria, the progression of the PCA, the MAR review results and the reviewer's knowledge and awareness of the State's Bridge Inspection Program.

#### **Recommendations:**

None for this section.

## Metric Number: 14 – Inspection Procedures – Post or Restrict

Assessment Level: Minimum

### Metric Summary

#### **Extent of Review:**

This Metric was assessed based on the progression of the Plan of Corrective Action (PCA), results of Metric Assessment Report (MAR) for Metric 14, previous review results, and on the reviewer's knowledge and awareness of the State's Bridge Inspection Program.

Intermediate assessment performed in PY2018.

#### **Observations:**

##### Documentation Review:

Metric 14 (Inspection Procedures – Post or Restrict) is under an active plan of corrective action (PCA). The PCA requires MDOT to implement the following corrective actions:

- 14-1 (PCA Completion - October 1st, 2018): MDOT must send a notification to all local bridge owners clarifying their roles and responsibilities.
  - Local Bridge Owners Guide Posted on September 28th, 2018 to provide bridge owners a high-level overview of the requirements set forth in the NBIS.
- 14-2 (PCA Completion – November 30th, 2020): MDOT will develop a comprehensive QA/QC program for local agency load postings. The program shall provide routine, independent and consistent QC checks on a minimum of 20% of local agencies each year and a minimum of 10% of the local agency's bridge inventory to verify the availability and accuracy of load posting data and field verification of load posting signs. This program will be administered in conjunction with the MDOT Bridge Inspection QA/QC contract.
  - MDOT contracted with Great Lakes Engineering Group (Load Rating Sub-consultant: Tetra Tech) and Spicer Group (Load Rating Sub-consultant: Bergmann) to perform local agency QA/QC of both load ratings and inspections. Each year, the QA/QC program will review an MDOT region or regions (2018 Review – North/University Regions), visiting one hundred percent of agencies within the region(s) and reviewing ten percent of each agency's inventory. The consultants will review the load ratings for accuracy of calculations and proper application of load rating theory, as well as for completeness of the load rating documentation, including proof of load posting when applicable.

- 14-3 (PCA Completion – October 31st, 2020): MDOT will create and implement a policy requiring images of the posting signs to be taken with each routine inspection and uploaded into MiBRIDGE for structures that are posted or restricted. MDOT will notify the Bridge Owners that the images must be uploaded for all structures that are posted or restricted starting with the next inspection following this notification. The notification will be sent to all users subscribed to the Bridge Advisory and MiBRIDGE Updates GovDelivery notifications. This includes FHWA, MDOT and local agency bridge owners, consultants, MDOT bridge inspectors, and other engineers.
  - MDOT Bridge Advisory (BA-2018-01) posted on April 30th, 2018 to notify bridge owners of revised Load Rating policy. MDOT Load Rating policy now requires that photographs of weight limit signs be taken during each routine inspection and stored electronically in the Michigan Bridge Management and Inspection System (MiBRIDGE). This requirement applies to the weight limit signs at each end of the bridge, as well as any advanced warning signs placed a suitable distance from each end of the bridge to enable vehicles to take a different route. If a posting sign is found to be missing, damaged, or vandalized, the sign should be replaced or repaired quickly once the issue is discovered.
- 14-4 (PCA Completion – April 30th, 2018): MDOT will prepare and publish updated load posting guidance. This will include guidance regarding proper posting sign values, correct coding of NBI items, and recommended procedures. MDOT will publish this information online and distribute a Bridge Advisory to all users subscribed to the Bridge Advisory and MiBRIDGE Updates GovDelivery notifications. This includes FHWA, MDOT and local agency bridge owners, consultants, MDOT bridge inspectors, and other engineers.
  - MDOT published Load Posting Guidance in the fall of 2016 to ensure proper posting procedures are followed. MDOT also issued Bridge Advisory (BA-2018-01) posted on April 30th, 2018 to notify bridge owners of revised Load Rating policy. MDOT Load Rating policy now requires that photographs of weight limit signs be taken during each routine inspection and stored electronically in the Michigan Bridge Management and Inspection System (MiBRIDGE). This bridge advisory was posted to ensure bridge posting adhere to applicable standards and reflect the information documented in the most recent load rating.
- 14-5 (PCA Completion – July 31st, 2020): MDOT will develop and implement additional data checks in MiBRIDGE to improve the accuracy of NBI posting data. Details regarding specific data checks will be provided in the quarterly reports.
  - MiBRIDGE was updated to limit data entry for Item 141 to 42T or less for GVW postings & 10T or less for axle weight postings. MDOT is in the process of reviewing the NBIP Metrics, the Metric Assessment Reports for Metrics 13/14, and other applicable FHWA guidance to develop additional data checks for MiBridge.

MAR Review:

The MAR identified two structures with a potential compliance deficiency. The compliancy deficiencies were reviewed and resolved (resolution not required).

SN 10063 - Load rating data was updated in January of 2018. Posting documentation was updated to reflect the current load rating data.

SN 14032 - Structure was added to the Houghton County Bridge Inventory in October of 2017. Load rating data was updated in June/July of 2018. Existing posting signs validated by load rating.

File Review (Metric 15 Inspection Procedures - Bridge Files):

No Metric 14 compliance deficiencies were identified in the intermediate assessment of Metric 15 (Inspection Procedures - Bridge Files).

Field Review (Metric 22 Inventory - Prepare and Maintain):

The intermediate assessment of Metric 22 (Inventory - Prepare and Maintain) identified two posting compliance deficiencies. Compliance deficiencies noted below:

SN 01997 - Item 70 (Bridge Posting) was incorrectly coded in the NBI. Item 70 was coded for No Posting Required (Code 5) whereas the structure was posted thus Item 70 should have been coded for posting required (Code of 4 or Less).

SN 04496 - Item 70 (Bridge Posting) was incorrectly coded in the NBI. Item 70 was coded for No Posting Required (Code 5) whereas the structure was posted thus Item 70 should have been coded for posting required (Code of 4 or Less).

**Findings:**

MDOT is adhering to an FHWA approved plan of corrective action (PCA). No indication of new/unknown compliance deficiencies noted.

**Conclusions:**

Conditionally Compliant. MDOT is adhering to an FHWA approved plan of corrective action (PCA).

This determination was based on the Divisions review of the National Bridge Inspection Standards for posting/restricting bridges (23 CFR §650.313 (c)), the National Bridge Inspection Program Compliance Criteria, the progression of the PCA, the MAR review results and the reviewer's knowledge and awareness of the State's Bridge Inspection Program.

**Recommendations:**

None for this section.

## Metric Number: 15 – Inspection Procedures – Bridge Files

Assessment Level: Intermediate

### Metric Summary

#### **Extent of Review:**

Metric was assessed based on the progression of the Plan of Corrective Action (May 31st, 2018 completion), file review results, and on the reviewer's knowledge and awareness of the State's Bridge Inspection Program.

#### **Observations:**

Metric 15 (Inspection Procedures – Bridge Files) is under an active plan of corrective action (PCA) until May 31st, 2018. The PCA required MDOT to implement the following corrective actions:

- 15-1 (PCA Completion - August 1st, 2017) - MDOT will update the MiSIM and provide additional clarification for documenting any special inspection procedures for routine inspections. The MiSIM will also be updated to clarify that by completing a routine inspection report the team leader is acknowledging the standard inspection procedures defined in Chapter 5 were followed.
  - Revisions to the Michigan Structure Inspection Manual (MSIM) were documented on November 16th, 2017 to clarify National Bridge Inspection documentation/inspection requirements for routine inspections.
- 15-2 (PCA Completion - August 1st, 2017) - MDOT will create an electronic file system where documents and photos can be uploaded through the MiBridge web application. The inspection reports will be updated to allow specific inspections procedures to be uploaded.
  - The Bridge Management and Inspection System (MiBridge) was modernized to support electronic document storage.
- 15-3 (PCA Completion - August 1st, 2017) - MDOT will update the Michigan Structure Inspection Manual to provide guidance for uploading and maintaining an electronic bridge file using the MiBRIDGE web application.
  - Electronic storage policy was developed and documented in the Michigan Structure Inspection Manual (MSIM) on November 27th, 2017.
- 15-4 (PCA Completion - August 1st, 2017) - MDOT will create and implement a policy for structures requiring fracture critical or underwater inspections to have the special inspection procedures uploaded into MiBRIDGE. This will include providing highlighted drawings or sketches indicating the fracture critical members. This action item is in alignment with the requirements of Metric 16 and Metric 17.
  - Electronic storage policy was developed and documented in the Michigan Structure Inspection Manual (MSIM) on November 27th, 2017.

- 15-5 (PCA Completion - August 1st, 2017) - MDOT will create and implement a policy for structures crossing waterways to have the waterway data uploaded into MiBridge. This will include providing the scour assessment and cross section data. This action item is in alignment with the requirements of Metric 18. MDOT will notify the Bridge Owners and request these documents to be uploaded for all bridges crossing a waterway and should be verified within the next two inspections.
  - Electronic storage policy was developed and documented in the Michigan Structure Inspection Manual (MSIM) on November 27th, 2017. MDOT Bridge Advisory (BA-2018-02) was posted on April 30th, 2018 to notify bridge owners of the electronic storage policy, this policy requires waterway data for each bridge to be maintained electronically within the Michigan Bridge Inspection and Management System (MiBridge).
- 15-6 (PCA Completion - May 31st, 2018) - MDOT will continue to verify bridge files are complete during MDOT's annual Quality Assurance reviews. MDOT currently completes quality assurance using an annual consultant contract which provides a weekly summary of the agencies reviewed and the issues found.
  - Subsequent to the development of the PCA, the State expanded the scope of the quality assurance review therefore the completion deadline was extended from December 1st, 2017 until May 31st, 2018. This review is intended to increase consistency and accuracy of inspection and inventory data, establish a system of checks and balances for bridge safety inspection and ensure adherence to the National Bridge Inspection Standards. As a result of the PY18 NBIP review MDOT has enhanced there QA/QC program to include the annual review of an MDOT Region or Regions(2018 Review – North/University Regions), visiting one hundred percent of agencies within the region(s) and reviewing ten percent of each agency's inventory.

#### File Review (Metric 15 Intermediate Assessment):

File reviews were conducted on a systematic random sample to assure Bridge Files complied with the National Bridge Inspection Standards and the National Bridge Inspection Programs compliance criteria. The systematic random sample provides the Division with a degree of control and sense of the process, and ensures an evenly sampled population. The minimum recommended sample size was nineteen, nineteen structures were selected for review.

The intermediate assessment of Metric 15 (Inspection Procedures - Bridge Files) identified several bridge file compliance deficiencies. Compliance deficiencies noted below:

#### Bridge File Deficiencies:

SN 08321: Bridge file unavailable.

#### Load Rating Specific Deficiencies:

SN 02788: Load rating documentation incomplete. Federal operating/inventory evaluation missing. Load rating was updated following NBIP review.

SN 08321: Load rating unavailable. Bridge file unavailable.

#### Waterway Specific Deficiencies:

SN 02788: Waterway cross-section missing. Cross-sections recorded following NBIP review.

SN 07022: Waterway cross-sections not recorded at recommended frequency interval (MDOT Guidelines for Bridge Inspection Frequencies).

SN 08159: Waterway cross-section not recorded at recommend frequency interval (MDOT Guidelines for Bridge Inspection Frequencies).

SN 08321: Bridge file unavailable. Inspection reports and inventory/evaluation data available electronically through the states web based structure management application (MiBridge)

SN 08629: Waterway cross-sections not recorded at recommend frequency interval (MDOT Guidelines for Bridge Inspection Frequencies).

#### Scour Specific Deficiencies:

SN 02788: Scour assessment invalid. Scour assessment recommends Item 113 be coded 6 (Scour calculation/evaluation has not been made) whereas Item 113 is coded 8 (Bridge foundations determined to be stable for assessed or calculated scour conditions). Scour assessment updated following NBIP review.

SN 07022: Scour assessment invalid. Item 113 was coded 7 (scour countermeasures have been installed to correct a previously existing problem with scour). No scour countermeasures were noted during the field review, steel sheet piling cofferdams from the existing construction were left-in-place but there was no evidence that they were designed to protect the structure against scour. Scour coding/assessment/plan of action updated following NBIP review.

SN 08159: Scour assessment invalid. Item 113 recommendation within level one scour assessment does not match NBI reported data. Scour assessment reviewed/updated following NBIP review.

SN 08321: Bridge file unavailable. Scour assessment unavailable.

Waterway Cross-Section/Scour Assessment deficiencies are being addressed with the PY18 Plan of Corrective action for Metric 18 (Inspection Procedures – Scour). Load rating deficiencies are being addressed with PY 18 Plan of Corrective action for Metrics 13(Inspection Procedures – Load Rating).

#### **Findings:**

The intermediate assessment for Metric 15 found that eighteen of the nineteen structures reviewed had bridge files and of the eighteen structures with bridge files seventy-one percent had the applicable significant components.



**Conclusions:**

Non-Compliant. Not all sampled structures had bridge files and less than eighty five percent of the bridge files reviewed had the applicable significant components.

This determination was based on the Divisions review of the National Bridge Inspection Standards for bridge files (23 CFR §650.313 (d)), the National Bridge Inspection Program Compliance Criteria, the progression of the PCA (May 31st, 2018 completion) and the reviewer's knowledge and awareness of the State's Bridge Inspection Program.

**Recommendations:**

Develop plan of corrective action (PCA) for Metric 15 (Inspection Procedures - Bridge Files) to ensure future compliance with the National Bridge Inspection Standards, and the National Bridge Inspection Program compliance criteria. The FHWA Division office recommends the PCA include the following:

- Bridge File self certification process for Bridge Owners. Process for Bridge Owners to certify that their Bridge Files comply with the National Bridge Inspection Standards and the National Bridge Inspection Program compliance criteria.
- Local Agency Bridge Owner Bridge File Maintenance Requirements

## Metric Number: 16 – Inspection Procedures – Fracture Critical Members

Assessment Level: Minimum

### **Metric Summary**

#### ***Extent of Review:***

This Metric was assessed based on previous review results and the reviewer's knowledge and awareness of the State's Bridge Inspection Program.

Intermediate assessment performed in PY2018.

#### ***Observations:***

Documentation Review:

MDOT developed the Michigan Structure Inspection Manual (MSIM) to provide guidance and clarification for the inspection of Bridges. The MSIM extensively covers fracture critical members and fatigue sensitive to ensure the proper identification of fracture critical members and the implementation of inspection procedures. Additional inspection frequency information can be found in the MDOT Bridge Advisory for Inspection Frequencies (2013-01).

MDOT also developed a Fracture Critical Inspection report which requires the inspector document inspection procedures, identified fracture critical members, condition information and recommendations (frequency, repairs, actions).

MDOT regularly schedules training courses for bridge safety inspection to ensure that each inspector is adequately trained and currently proficient with the respect to fracture critical member inspection.

File Review (Metric 15 Inspection Procedures - Bridge Files):

No Metric 16 compliance deficiencies were identified in the intermediate assessment of Metric 15 (Inspection Procedures - Bridge Files).

#### ***Findings:***

None for this section.

#### ***Conclusions:***

Compliant. This determination was based on the Divisions review of the National Bridge Inspection Standards for fracture critical members (23 CFR §650.313 (e) (1)), the National Bridge Inspection Program Compliance Criteria, previous review results and the reviewer's knowledge and awareness of the State's Bridge Inspection Program.

#### ***Recommendations:***

None for this section.

## Metric Number: 17 – Inspection Procedures - Underwater

Assessment Level: Intermediate

### Metric Summary

#### **Extent of Review:**

Metric was assessed based on the file review results, field review results (Metric 12) and on the reviewer's knowledge and awareness of the State's Bridge Inspection Program.

#### **Observations:**

Documentation Review:

MDOT developed the Michigan Structure Inspection Manual (MSIM) to provide guidance and clarification for the inspection of Bridges. The MSIM supplements the inspection techniques, requirements and procedures provided in the FHWA Bridge Inspectors Reference Manual and AASHTO Manual for Bridge Evaluation. The MSIM covers the following underwater inspection topics:

Underwater Inspection Methods

- Wade and Probe
- Boat and Probe
- Underwater Diving Inspection

Underwater Diving Levels of Inspection Intensity

- Level I (Visual Inspection)
- Level II (Detailed Inspection with Cleaning)
- Level III (Non-Destructive/Destructive Testing)

Types and Frequency of Underwater Inspections

Underwater Inspector Qualifications

Underwater Inspection Procedures (Bridge Owner/Team Leader)

Data Entry (Bridge Safety Inspection Report/Underwater Inspection Report)

Additional inspection frequency information can be found in the MDOT Bridge Advisory for Inspection Frequencies (2013-01).

MDOT also developed a underwater Inspection report which requires the inspector document inspection procedures (identification of substructure units, type of equipment/access, personnel, level of inspection, weather/waterway information, navigation elements, required coordination, existence of scour countermeasures), condition information and recommendations (coding, frequency, repairs, actions).

File review (Metric 15 Inspection Procedures - Bridge Files):

No compliance deficiencies were identified in the intermediate assessment of Metric 15 (Inspection Procedures - Bridge Files).

File Review (Metric 17 Inspection Procedures - Underwater):

File reviews were conducted on a systematic random sample to assure all structures requiring underwater inspections had documented procedures, and inspections were performed according to these procedures. The systematic random sample provides the Division with a degree of control and sense of the process and ensures an evenly sampled population. The minimum recommended sample size was eighteen, eighteen structures were selected for review. Note: One of the eighteen structures selected for review was reconstructed. The appropriate method of inspection for the reconstructed structure is wade and probe.

No compliance deficiencies were identified in the intermediate assessment of Metric 17 (Inspection Procedures - Underwater). Underwater inspections were performed in accordance with documented structure specific inspection procedures. Inspection procedures are documented within the underwater inspection reports, procedures identify applicable underwater elements, scour countermeasures, access/equipment, waterway information (features/characteristics), personnel, level of inspection and applicable risk factors.

Field Review (Metric 12 Inspection Procedures - Quality Inspections):

No Metric 17 compliance deficiencies were identified in the minimum assessment of Metric 12 (Inspection Procedures - Quality Inspections).

**Findings:**

None for this section.

**Conclusions:**

Compliant. All sampled bridges have documented inspection procedures and were inspected according to those procedures.

This determination was based on the Divisions review of the National Bridge Inspection Standards for underwater inspections (23 CFR §650.313 (e)), the National Bridge Inspection Program Compliance Criteria for Metric 17, file and field review results and the reviewer's knowledge and awareness of the State's Bridge Inspection Program.

**Recommendations:**

None for this section.

## Metric Number: 18 – Inspection Procedures – Scour Critical Bridges

Assessment Level: Minimum

### Metric Summary

#### **Extent of Review:**

This Metric was assessed based on the progression of the Plan of Corrective Action (PCA), results of Metric Assessment Report (MAR) for Metric 18, previous review results, and on the reviewer's knowledge and awareness of the State's Bridge Inspection Program.

Intermediate assessment performed in PY2018.

#### **Observations:**

Documentation Review:

Metric 18 (Inspection Procedures – Load Rating) is under an active plan of corrective action (PCA). The PCA requires MDOT to implement the following corrective actions:

- 18-1 (PCA Completion - October 1st, 2018): MDOT will send a notification to all local bridge owners clarifying their roles and responsibilities for the NBIS and explaining the funding impacts of non-compliance.
  - Local Bridge Owners Guide Posted on September 28th, 2018 to provide bridge owners a high-level overview of the requirements set forth in the NBIS.
- 18-2 (PCA Completion - October 31st, 2020): MDOT will create and implement a policy requiring waterway data to be uploaded into MiBRIDGE for structures crossing waterways. This will include providing the scour assessment, POAs as required, and cross section data. This action item is in alignment with the requirements of Metric 18. MDOT will notify the Bridge Owners that these documents must be uploaded for all bridges crossing a waterway and should be verified within the next inspection cycle. The notification will be sent to all users subscribed to the Bridge Advisory and MiBRIDGE Updates GovDelivery notifications. This includes FHWA, MDOT and local agency bridge owners, consultants, MDOT bridge inspectors, and other engineers.
  - MDOT Bridge Advisory (BA-2018-02) posted on April 30th, 2018 to notify bridge owners of revised waterway information documentation policy. MDOT policy now requires waterway data for each bridge to be maintained electronically within the Michigan Bridge Inspection and Management System (MiBridge).
- 18-3 (PCA Completion - October 31st, 2018): MDOT will provide annual notifications to the bridge owners highlighting the need to implement the actions within their Scour Critical Bridge Plans of Action.
  - MDOT has implemented a process to ensure annual notifications are sent to bridge owners. The notifications anniversary month is the month of March.

- 18-4 (PCA Completion - November 30th, 2020): MDOT will continue to verify bridge files are complete during MDOT's annual Quality Assurance reviews. MDOT currently completes quality assurance using an annual consultant contract which provides a weekly summary of the agencies reviewed and the issues found.
  - MDOT contracted with Great Lakes Engineering Group (Load Rating Sub-consultant: Tetra Tech) and Spicer Group (Load Rating Sub-consultant: Bergmann) to perform local agency QA/QC of both scour evaluations/POA and inspections. Each year, the QA/QC program will review an MDOT region or regions (2018 Review – North/University Regions), visiting one hundred percent of agencies within the region(s) and reviewing ten percent of each agency's inventory. The consultants will review scour documentation for accuracy, completeness and proper application of scour rating theory.

MAR Review:

The MAR identified seven structures with a potential compliance deficiencies. The compliancy deficiencies were reviewed and resolved.

SN 00594 - Reviewed - NBI data was correct, compliance deficiency now corrected. Interim rating (6- Scour calculation has not been made.) while structure was evaluated for scour.

SN 01092 - Reviewed - NBI data was correct, compliance deficiency now corrected. Interim rating (6- Scour calculation has not been made.) while structure was evaluated for scour.

SN 03862 - Reviewed - NBI data was correct, compliance deficiency now corrected. Interim rating (6 - Scour calculation/evaluation has not been made.) while under reconstruction.

SN 12249 - Reviewed - NBI data was correct, compliance deficiency now corrected. Interim rating (6- Scour calculation has not been made.) while structure was re-evaluated for scour.

SN 14031 - Reviewed - NBI data was correct, compliance deficiency now corrected. Interim rating (6- Scour calculation has not been made.) while structure was evaluated for scour.

SN 14038 - Reviewed - NBI data was correct, compliance deficiency now corrected. Interim rating (6- Scour calculation has not been made.) while structure was evaluated for scour.

SN 14040 - Reviewed - NBI data was correct, compliance deficiency now corrected. Interim rating (6- Scour calculation has not been made.) while structure was evaluated for scour.

File Review (Metric 15 Inspection Procedures - Bridge Files):

The intermediate assessment of Metric 15 (Inspection Procedures - Bridge Files) identified two Metric 13 compliance deficiencies. Compliance deficiencies noted below:

SN 02788: Scour assessment invalid. Scour assessment recommends Item 113 be coded 6 (Scour calculation/evaluation has not been made) whereas Item 113 is coded 8 (Bridge foundations determined to be stable for assessed or calculated scour conditions). Scour assessment updated following NBIP review.

SN 07022: Scour assessment invalid. Item 113 was coded 7 (scour countermeasures have been installed to correct a previously existing problem with scour). No scour countermeasures were noted during the field review, steel sheet piling cofferdams from the existing construction were left-in-place but there was no evidence that they were designed to protect the structure against scour. Scour coding/assessment/plan of action updated following NBIP review.

SN 08159: Scour assessment invalid. Item 113 recommendation within level one scour assessment does not match NBI reported data. Scour assessment reviewed/updated following NBIP review.

**Findings:**

MDOT is adhering to an FHWA approved plan of corrective action (PCA). No indication of new /unknown compliance deficiencies noted.

**Conclusions:**

Conditionally Compliant. MDOT is adhering to an FHWA approved plan of corrective action (PCA).

This determination was based on the Divisions review of the National Bridge Inspection Standards for load rating (23 CFR §650.313 (e)), the National Bridge Inspection Program Compliance Criteria, the progression of the PCA, the MAR review results and the reviewer's knowledge and awareness of the State's Bridge Inspection Program.

**Recommendations:**

None for this section.

## Metric Number: 19 – Inspection Procedures – Complex Bridges

Assessment Level: Intermediate

### Metric Summary

#### **Extent of Review:**

Metric was assessed based on the file review results, field review results (Metric 12) and on the reviewer's knowledge and awareness of the State's Bridge Inspection Program.

#### **Observations:**

##### Documentation Review:

MDOT developed the Michigan Structure Inspection Manual (MSIM) to provide guidance and clarification for the inspection of Bridges. The MSIM supplements the inspection techniques, requirements and procedures provided in the FHWA Bridge Inspectors Reference Manual, AASHTO Manual for Bridge Evaluation AASHTO Manual for Movable Bridge Inspection, Evaluation, and Maintenance. MDOT also developed a movable bridge inspection checklist and example complex bridge inspection procedures (MSIM Appendix B) to assure that all complex bridge inspection procedures complied with all applicable regulation/policy/guidance.

Metric 19 (Inspection Procedures – Complex Bridges) was under an active improvement plan (IP) until August 1st, 2018. The improvement plan (IP) required MDOT to implement the following actions:

- 19-1 (IP Completion – March 31st, 2015): MDOT will issue a formal letter to local agencies who have complex bridges within their inventory which clarifies the requirements of 23 CFR 650.313 (f) and the necessity to implement a plan for improved compliance.
  - MDOT performed a query of the bridge management database to identify local agencies with complex bridges and sent formal letters to the designated bridge owners on January 28, 2015.
- 19-2 (IP Completion – July 1st, 2015): MDOT will meet with each affected local agency to establish an implementation schedule for the development of procedures, required inspection team leader experience, and frequencies for in-depth inspection of structural, mechanical, and electrical components.
  - MDOT conducted meetings to gain an improved understanding for each agency's method of performing complex bridge inspection and maintenance. These discussions were held with the following bridge owners during the months of May and June:
    - City of Manistee
    - City of Alpena
    - City of Port Huron
    - City of Bay City
    - City of South Haven
    - Wayne County



Due to a personal injury suffered by the Village of Alanson bridge owner the meeting scheduled for June 18th, 2015 was cancelled. However, MDOT contacted the village's most recent bridge inspection consultant and obtained as-built plans, rehabilitation drawings, and inspection photos for their movable bridge. On August 4th, 2015, the requirements of Metric 19 were discussed with the bridge owner during a bridge inspection quality assurance review meeting. MDOT also contacted the Wisconsin Department of Transportation (WisDOT) to determine whether the City of Menominee should be responsible to complete development of inspection procedures and inspector qualifications for a movable border bridge. WisDOT confirmed that the State of Wisconsin performs routine NBI inspections every 12 months and fracture critical inspections at 24 month intervals for the border bridge.19-3 (IP Completion – September 1st, 2015):

- 19-3 (IP Completion – September 1st, 2015): MDOT will develop guidance and inspection requirements specifically related to complex bridges within local agency jurisdictions based per the feedback and limitations realized during the meetings. The procedures and requirements will be delineated in the Michigan Structure Inspection Manual (MiSIM) and issued as an attachment in a letter to specific local agencies requesting an implementation schedule.
  - MDOT posted Appendix B of the Michigan Structure Inspection Manual on the Bridge Operations Website ([https://www.michigan.gov/mdot/0,4616,7-151-9625\\_24768\\_24773-326737-,00.html](https://www.michigan.gov/mdot/0,4616,7-151-9625_24768_24773-326737-,00.html)) during the week of September 1st, 2015. The appendix describes the purpose of complex bridge inspection procedures and sets forth the development of them for all complex bridge inspections which are completed after November 1st, 2015. Furthermore, example procedures for an MDOT owned movable bridge were provided to assist bridge owners or vendors completing the requirements on their behalf.
- 19-4 (IP Completion – April 1st, 2016): MDOT will monitor enactment of the agency specific implementation plan through submittal of an Inspection Procedures Checklist to Bureau of Bridges and Structures during each biennial inspection. In addition, the scope of service for MDOT's Quality Assurance Review Program (renewal anticipated during November 2015) will also be modified to address the changes to the inspection program.
  - MDOT posted a Complex Bridge Inspection Procedures checklist on the MDOT Bridge Operations Website ([https://www.michigan.gov/documents/mdot/Complex\\_Checklist\\_2015-8-31\\_498874\\_7.pdf](https://www.michigan.gov/documents/mdot/Complex_Checklist_2015-8-31_498874_7.pdf)) during the week of September 1st, 2015. Correspondence sent via email was then provided to the bridge owners to remind them of the required timeframe for response and that new information was available online
- 19-5 (IP Completion – March 31st, 2018): MDOT Bureau of Bridges and Structures will provide annual updates regarding the status of complex bridge inspection procedure development for each agency. The report will contain the checklist and inspection procedures completed by each agency.

Date for first submittal: March 31, 2016

Date for second submittal: March 31, 2017

Date for final submittal: March 31, 2018

- The completion date of this action item was delayed due to the non-compliance of three local agency bridge owners. Non-compliance was addressed through a non-compliance notification sent to each agency on July 12th, 2018. This notification required the three local agencies to comply with the requirements set forth by the National Bridge Inspection Standards by August 1st, 2018. If the local agencies failed to comply by said date MDOT would withhold Federal-Aid Highway Funds and Michigan Transportation Funds, until complex bridge inspection procedures are completed and entered into the Michigan Bridge Management and Inspection System. Note: Complex Bridge Inspection Procedures were developed and entered by the August 7th, 2018 deadline.

#### File review (Metric 15 Inspection Procedures - Bridge Files)

No compliance deficiencies were identified in the intermediate assessment of Metric 15 (Inspection Procedures - Bridge Files).

#### File Review (Metric 19 Inspection Procedures - Complex Bridges):

File reviews were conducted on a systematic random sample to assure Bridge Files complied with the National Bridge Inspection Standards and the National Bridge Inspection Programs compliance criteria. The systematic random sample provides the Division with a degree of control and sense of the process, and ensures an evenly sampled population. The minimum recommended sample size was eight, eleven structures (MDOT responsible for the inspection of ten structures, WisDOT responsible for the inspection of one structure) were selected for review.

No compliance deficiencies were identified in the intermediate assessment of Metric 19 (Inspection Procedures - Complex Bridges). The intermediate assessment verified that all sampled bridges have documented structure specific complex inspection procedures and were inspected by qualified professional engineers with knowledge of complex structures.

In general structure specific complex inspection procedures included a general description of the structure/waterway, routine/fracture inspection procedures/frequencies, detailed inspection procedures for structural, mechanical/hydraulic, and electrical components. Inspection procedures also included a detailed description of complex components (risk factors, location, pictures, inspection frequency). Maintenance checklist/procedures were well documented in all cases, these procedures/checklist verified that electrical/mechanical/hydraulic components are being inspected at regular intervals between detailed inspections (6-year inspection cycle as per 2.1.5.4 of the AASHTO Movable Bridge Inspection, Evaluation, and Maintenance Manual)

Note: Not all structure inspections were performed in accordance with the structure specific inspection procedures in the bridge file as the State was under an approved IP until August 1st, 2018. Bridge specific procedures will be followed for all future structural inspections, and for routine/in-depth evaluations of the mechanical/electrical systems.

#### Field Review (Metric 12 Inspection Procedures - Quality Inspections):

No Metric 19 compliance deficiencies were identified in the minimum assessment of Metric 12 (Inspection Procedures - Quality Inspections).

**Findings:**

None for this section.

**Conclusions:**

Compliant. All bridges have structure specific complex bridge inspection procedures that include inspector training/qualification requirements. All bridges have either been inspected or will be inspected using the structure specific complex bridge inspection procedures.

This determination was based on the Divisions review of the National Bridge Inspection Standards for complex bridges (23 CFR §650.313 (f)), the National Bridge Inspection Program Compliance Criteria, the results of the file/field review, and the reviewer's knowledge and awareness of the State's Bridge Inspection Program.

**Recommendations:**

None for this section.

## Metric Number: 20 – Inspection Procedures – QC/QA

Assessment Level: Minimum

### Metric Summary

#### **Extent of Review:**

This Metric was assessed based on previous review results and the reviewer's knowledge and awareness of the State's Bridge Inspection Program.

Intermediate assessment performed in PY2015.

#### **Observations:**

Document Review:

MDOT developed the Michigan Structure Inspection Manual (MSIM) to provide guidance and clarification for the inspection of Bridges. The MSIM adequately defines the quality assurance (QA)/quality control (QC) process, procedures, roles and responsibilities.

The MSIM requires each agency maintain QC procedures. QC reviews must be performed on a yearly basis and must include file and field reviews. File reviews must be performed on at least five percent of the inspections and load ratings performed by an individual. Field reviews must be performed on fifty percent of the bridges selected for a file review.

The MSIM requires the State to preform QA reviews of on select agencies (agency selection based on targeted or random sampling methods) to improve the quality of the bridge inspection program. The QA reviews performed by MDOT, or a consultant acting on their behalf, will verify the use of effective QC procedures for each bridge owner and review bridge files for approximately ten percent of the total network. Further action will occur with conducted field reviews on at least fifty percent of the files selected. A QA report must be generated for each bridge that is reviewed during the process. This will aid the bridge owner as deficiencies are identified for each team leader. The QA review process includes the evaluation of the following items:

- Bridge file is being maintained for QC activities, personnel credentials, and each bridge in the inventory.
- The inspector entering the reports meets the minimum requirements of a team leader.
- The load rating engineer is a licensed professional engineer in Michigan.
- The diving inspector has successfully completed an FHWA approved comprehensive bridge inspection or underwater diver bridge inspection training course.
- The inspections for the entire inventory were completed on time.
- The quantity of inspections performed each day are suitable

Following the PY18 National Bridge Inspection Program review MDOT developed a comprehensive QA/QC program to comply with the requirements set forth in the National Bridge Inspection Standards. This program provides routine, independent and consistent reviews (yearly) on a minimum of twenty percent of agencies and ten percent of each agencies bridge inventory to verify the availability/accuracy of bridge data (inspection/load rating/posting documentation). The reviews are performed by MDOT or hired consultants on selected agencies, agency selection is based on targeted or random sampling methods (based on the Bridge Inspection Program Mangers knowledge and awareness).

In PY2019 MDOT contracted with Great Lakes Engineering Group (Load Rating Sub-consultant: Tetra Tech) and Spicer Group (Load Rating Sub-consultant: Bergmann) to perform local agency QA/QC of inspection documentation. The PY19 review will include MDOTs North/University regions, and all the local agencies within each region.

Each agency subject to a QA/QC review receives a report which details key findings and recommendations for improvement. If deficiencies are noted during a QC/QA review additional reviews may be required to ensure future compliance with the National Bridge Inspection Standards.

File Review (Metric 15 Inspection Procedures - Bridge Files):

No compliance deficiencies were identified in the intermediate assessment of Metric 15 (Inspection Procedures - Bridge Files).

***Findings:***

None for this section.

***Conclusions:***

Compliant. QC/QA procedures are established, documented, implemented, and effective. QC/QA procedures include periodic field review of inspection teams, periodic refresher training requirements, and independent review of inspection reports and computations.

This determination was based on the Divisions review of the National Bridge Inspection Standards for quality control/assurance (23 CFR §650.313 (g)), the National Bridge Inspection Program Compliance Criteria for Metric 20, file review results (Metric 15 Inspection Procedures - Bridge Files), previous review results and the reviewer's knowledge and awareness of the State's Bridge Inspection Program.

***Recommendations:***

Develop a documented process to assure compliance deficiencies identified during the QA/QC review are addressed in a timely manner.

## Metric Number: 21 – Inspection Procedures – Critical Findings

Assessment Level: Minimum

### Metric Summary

#### **Extent of Review:**

This Metric was assessed based on previous review results and the reviewer's knowledge and awareness of the State's Bridge Inspection Program.

Intermediate assessment performed in PY2015.

#### **Observations:**

Documentation Review:

MDOT defines a critical finding as any structural or safety related deficiency that requires immediate follow-up inspection/action or an entire bridge, lane or shoulder be closed to protect public safety.

MDOT developed the Michigan Structure Inspection Manual (MSIM) to provide guidance and clarification for the inspection of Bridges. The MSIM adequately defines the critical finding process, procedures, roles and responsibilities.

MDOT also created the MDOT Bridge Request for Action Coordination Committee. The MDOT RFA Coordination Committee is responsible for reviewing the information on the RFA dashboard (within the Michigan Bridge and Inspection System Web Application), prioritizing, initiating action, monitoring, and ensuring resolution and/or following up all bridge related request for actions statewide for MDOT owned structures.

Local Agency bridge owners are responsible for reporting, prioritizing, initiating action, monitoring and ensure resolution of critical findings. The RFA dashboard within the Michigan Bridge and Inspection Web Application is available to all bridge owners, but the use of said dashboard is not required. During the PY18 Joint (FHWA/MDOT) Bridge Program Evaluation the absence of review/follow-up procedures for local agency critical findings was noted as weakness, FHWA/MDOT plan to address this weakness with the development of a effective solution to assure critical findings are documented and addressed according to MDOT procedures and in compliance with the National Bridge Inspection Standards.

File Review (Metric 15 Inspection Procedures - Bridge Files):

No compliance deficiencies were identified in the intermediate assessment of Metric 15 (Inspection Procedures - Bridge Files). The following bridge files were reviewed for compliance:

SN 03769 - Priority 3 Request for Action per RFA Committee (12-18 month resolution per approved procedures).

SN 11578 - Repair complete

Field Review (Metric 12 Inspection Procedures - Quality Inspections):

No compliance deficiencies were identified in the minimum assessment of Metric 12 (Inspection Procedures - Quality Inspections) The following bridges were reviewed for compliance:

SN 03769 - Priority 3 Request for Action per RFA Committee (12-18 Month Resolution per Approved Procedures).

SN 02742 - Bridge closed due to condition.

SN 04496 - No critical finding. Bridge selected for review based on sampling tool criteria (NBI criteria)  
SN 11578 - Repair complete

**Findings:**

None for this section.

**Conclusions:**

Compliant. Critical findings are address and documented in accordance with implemented procedures to assure critical findings are addressed in a timely manner. FHWA is being notified per established procedures.

This determination was based on the Divisions review of the National Bridge Inspection Standards for critical findings (23 CFR §650.313 (h)), the National Bridge Inspection Program Compliance Criteria for Metric 21, file/field results, previous review results and the reviewer's knowledge and awareness of the State's Bridge Inspection Program.

**Recommendations:**

Develop local agency review/follow-up procedures to assure critical findings are documented and addressed according to MDOT procedures and in compliance with the National Bridge Inspection Standards.

## Metric Number: 22 – Inventory – Prepare and Maintain

Assessment Level: Intermediate

### Metric Summary

#### **Extent of Review:**

This Metric was assessed based on the results of the safety related checks and persistent error reports, field reviews and on the reviewer's knowledge and awareness of the State's Bridge Inspection Program. Field reviews were performed on a systematic random sample to verify structure inventory and appraisal items (twenty-six items) with actual field conditions.

Field Review Forms and Supporting Documentation Attached to Metric 12 (Inspection Procedures - Quality Inspections).

#### **Observations:**

Documentation Review:

MDOT developed the Michigan Structure Inspection Manual (MSIM) to provide guidance/clarification for the inspection of Bridges, reinforce the policies/procedures of MDOT and the FHWA, ensure statewide consistency and improve compliance with the National Bridge Inspection Standards. The MSIM is updated periodically to document revised/new policies.

Field Review:

Field reviews were conducted on a systematic random sample of structure inspections performed during the previous calendar year to verify structure inventory and appraisal items (twenty-six items) with actual field conditions. The systematic random sample provides the Division with a degree of control and sense of the process, and ensures an evenly sampled population. The minimum recommended sample size was nineteen, twenty structures were selected for review.

Field reviews were coordinated with the State Program Manager. If schedules permitted the State program manager or other applicable inspection staff participated in the field reviews. Field reviews were not coordinated with the Team leaders of sampled bridge inspections.

Field review observations are as follows:

Safety related checks were reviewed (Posted, Posting Recommended) to ensure requirements/regulations were being adhered to by the Michigan Department of Transportation. No persistent errors were identified during the NBI submittal process.

Twenty-six structural inventory and appraisal items were identified and reviewed on twenty structures selected for a field review. A total of five hundred and twenty items were reviewed to ensure consistent reporting of the actual field conditions. Of the five hundred and twenty items, five hundred and four were found to be compliant (96.9percent).



File Review (Metric 15/17/19 Inspection Procedures - Bridge Files/Underwater/Complex Bridges):

The intermediate assessments of Metric 15/17/19 (Inspection Procedures - Bridge Files/Underwater/Complex bridges) identified one NBI data error. Compliance deficiency noted below:

SN 06880 - NBI Item 58 (Deck) and Item 60 (Substructure) do not match those reported by WisDOT. WisDOT is responsible for performing all applicable inspections.

Field Review Forms and Supporting Documentation Attached to Metric 12 (Inspection Procedures - Quality Inspections).

***Findings:***

None for this section.

***Conclusions:***

Compliant. At least 95 percent of the sampled bridge inventory items reviewed are within the acceptable tolerances, and data checks did not identify any bridges with data errors.

Field Review Forms and Supporting Documentation Attached to Metric 12 (Inspection Procedures - Quality Inspections).

***Recommendations:***

MDOT shall contact responsible agency to address any deficiencies noted during the NBIP review.

## Metric Number: 23 – Inventory – Timely Updating of Data

Assessment Level: Minimum

### Metric Summary

#### **Extent of Review:**

This metric was assessed based on the results of the timeliness reports, previous review results and on the reviewer's knowledge and awareness of the State's Bridge Inspection Program.

Intermediate assessment performed in PY2018.

#### **Observations:**

Documentation Review:

MDOT developed the Michigan Structure Inspection Manual (MSIM) to provide guidance and clarification for the inspection of Bridges. The MSIM requires Structure Inventory and Appraisal Data be entered in the Michigan Bridge and Inspection System by the end of the preceding month in which the inspection was due. This requirement allows the Bridge Inspection Program Manager to report on timeliness earlier than what is required by regulation, ensuring compliance with the National Bridge Inspection Standards.

In addition, MDOT issued Bridge Advisories to clarify and expand on existing policies/guidance. The following is a list of Inspection Timeliness Bridge Advisories developed/issued to clarify and expand on existing policy/guidance:

BA-2014-02 (Michigan Structure Inspection Manual Release)

BA-2014-03 (MiBridge Inspection Report Submission and Unassigned Inspections)

Timeliness information is available through the Report Assignment Dashboard in the Michigan Bridge and Inspection System.

Timeliness Review:

Timeliness reports were generated/reviewed to ensure the timely updating of the Structure Inventory and Analysis Data after an inspection, modification or changes in load restrictions (Ninety Days for State Owned, 180 Days for All Other Bridges). The timeliness reports verified that Structure Inventory and Appraisal data for randomly sampled bridges (minimum sample size nineteen, sample size nineteen) was updated within 90/180 day timeframes.

Structure Inventory and Appraisal Data was submitted to the FHWA by the requested date with no errors preventing FHWA acceptance.

#### **Findings:**

None for this section.

**Conclusions:**

Compliant. The state has a process to verify data was updated in a timely manner. Data was updated within the acceptable timeframes (based on random sample verification) and data was submitted to the FHWA NBI by the requested date with no errors preventing FHWA acceptance of the data.

This determination was based on the Divisions review of the National Bridge Inspection Standards for inspection timeliness (23 CFR §650.315 (b)), the National Bridge Inspection Program Compliance Criteria, timeliness reports and the reviewer's knowledge and awareness of the State's Bridge Inspection Program.

**Recommendations:**

None for this section.

