2012 Michigan Bridge Conference
Bridge Inspection Workshop

2011 NBI Metric Review Procedures for Local Agencies

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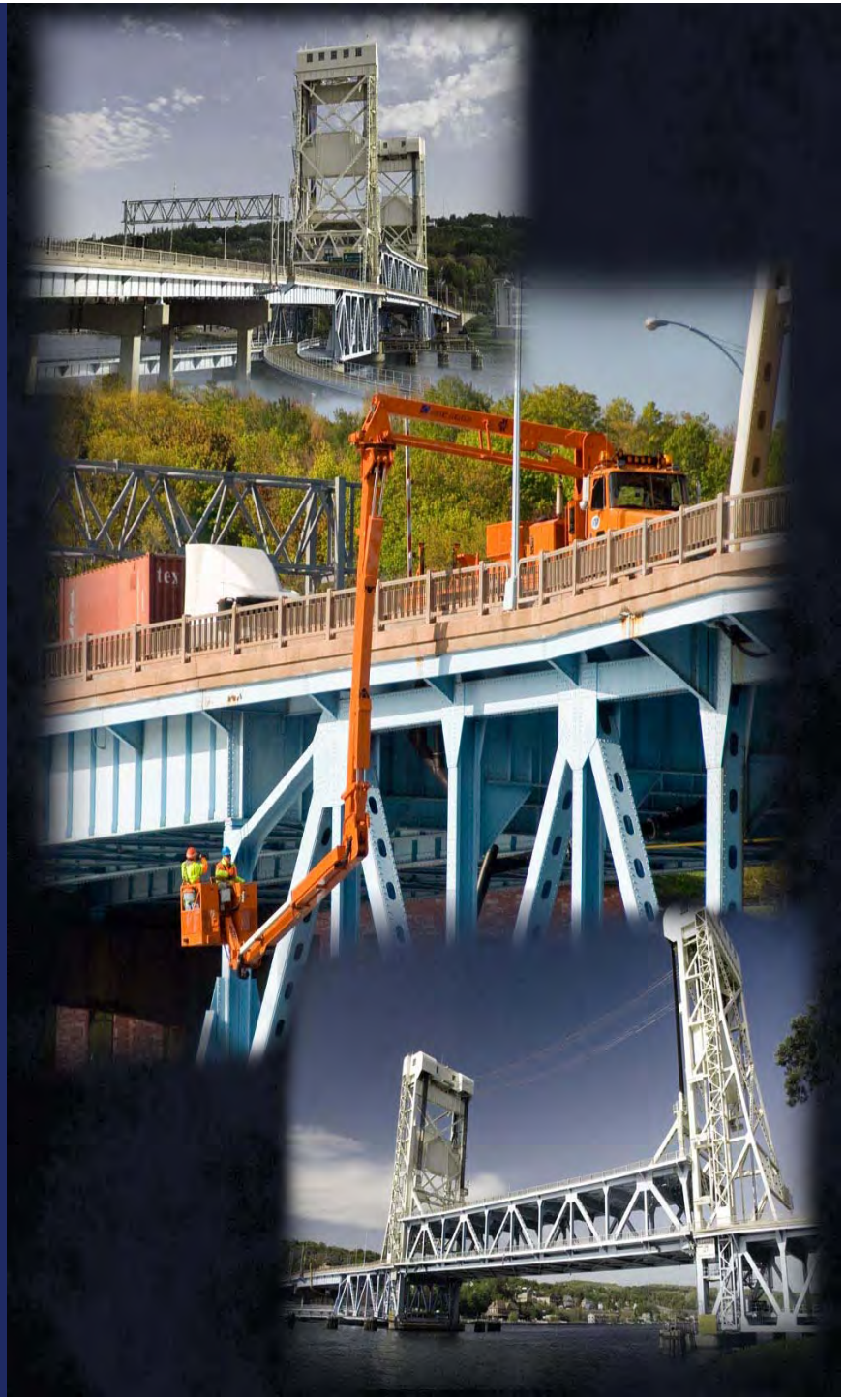
March 20, 2012



NBI Program Review – 23 Metrics

FHWA Goals for the New Review Process

- Clear expectations for each State;
- Consistent criteria to evaluate each metric annually;
- Compliance based upon criteria listed for each metric

Note: NBIS Regulations have not been updated

NBI Program Review – 23 Metrics

Summary of 23 Metrics:

1	Bridge Inspection Organization	*CFR 650.307*
2-5	Qualifications	*CFR 650.309*
6-11	Inspection Frequency	*CFR 650.311*
12-21	Inspection Procedures	*CFR 650.313*
22-23	Inventory and Data	*CFR 650.315*

Several of the Metrics overlap

Each Metric - 3 LEVELS of Review

Minimum:	FHWA Division's Knowledge of Program
Intermediate:	Based on Random Samples and site visits
In-depth:	Increased Sample size and site visits

NBI Program Review – 23 Metrics

Levels of Compliance

- Compliance (C)
- Non Compliance (NC)
  - Substantial Compliance (SC)
  - Conditional Compliance (CC)

During the review process there are basically (2) Levels of Compliance (C or NC)

Once in Non-Compliance, Approved Plans to fix the issues can change compliance to:

(SC) Deficiencies found can be quickly resolved (less than a year)
Improvement Plan (IP)

(CC) Deficiencies found will take more time to resolve and implement
Plan of Corrective Action (PCA)

NBI Program Review – 23 Metrics

C = Compliance
CC = Conditional Compliance
SC = Substantial Compliance

Status of Metric Review

	METRIC	DESCRIPTION	STATUS	ACTION
Qualifications	1	Bridge inspection organization	C	
	2	Qualifications of personnel Program Manager	C	
	3	Qualifications of personnel Team Leader(s)	C	
	4	Qualifications of personnel Load Rating Engineer	C	
	5	Qualifications of personnel UW Bridge Inspection Diver	C	
Inspection Frequency	6	Inspection frequency Routine	CC	PCA_2011_M6
	7	Inspection frequency Routine Extended	C	
	8	Inspection frequency Underwater	CC	PCA_2011_M8
	9	Inspection frequency Underwater Extended	C	
	10	Inspection frequency Fracture Critical Member	CC	PCA_2011_M10
	11	Inspection frequency Damage, In-depth or Special	SC	IP_2011_M11

	METRIC	DESCRIPTION	STATUS	ACTION
Inspection Procedures	12	Inspection procedures Team Leader	C	
	13	Inspection procedures Load Rating	CC	PCA 2008
	14	Inspection procedures Post or Restrict	SC	IP_2011_M14
	15	Inspection procedures Bridge Files	CC	PCA_2011_M15
	16	Inspection procedures Fracture Critical Members	CC	PCA_2011_M16
	17	Inspection procedures Underwater	C	
	18	Inspection procedures Scour Critical Bridges	C	
	19	Inspection procedures Complex Bridges	C	
	20	Inspection procedures QC/QA	SC	IP_2011_20
	21	Inspection procedures Critical Findings	CC	PCA_2011_M21
	22	Inventory Prepare and Maintain	C	
	23	Inventory Update Data	C	

Metric 1: **Bridge Inspection Organization**

Does the State transportation department have an organization that inspects or causes to be inspected, all highway bridges on public roads. 650.307

Real Question:

Does the State have an organization capable of monitoring NBIS standards and running the NBI within the state?

Review Criteria:

Clearly Defined Roles and Responsibilities for each of the following:

- Bridge Inspection Policies and Procedures
- Quality Control & Quality Assurance
- Preparation and Maintenance of Bridge Inventory, Bridge Inspections, Reports, Load Ratings, and Delegation of authority policies and procedures.

Metric Finding: Compliant

- Metric 1 was last one to be evaluated (Dependent on other 22 metrics)

Metrics 2-5 Qualifications of Personnel

2011 FHWA METRICS (2010 Data Review)

	METRIC	DESCRIPTION	STATUS	ACTION
QUALIFICATIONS	2	Qualifications of personnel Program Manager	Compliant	
	3	Qualifications of personnel Team Leader(s)	Compliant	
	4	Qualifications of personnel Load Rating Engineer	Compliant	
	5	Qualifications of personnel UW Bridge Inspection Diver	Compliant	

Metric 2: **Qualifications of personnel – Inspection Program Manager**

Does the Program Manager meet the requirements in paragraphs 650.309 (a) and 650.313(g)?

Metric Finding: Compliant

EDUCATION/TRAINING

B.S. Michigan Technological University 1992
Professional Engineer, State of Michigan, 1998

NHI	130055	Safety Inspection of In-Service Bridges
NHI	130078	Facture Critical Inspection Techniques for Steel Bridges
NHI	130053	Bridge inspection Refresher
NHI	130099	Bridge Inspection Non-Destructive Evaluation Showcase

BRIDGE INSPECTION HISTORY

1993-1998, 2004	Spicer Group, Saginaw, MI
1998-2000	HNTB, East Lansing
2004-2008	MDOT, Movable Bridge/Fracture Critical Engineer
20010 – Current	MDOT, Bridge Safety Inspection Engineer

Metric 3: **Qualifications of personnel – Team Leader(s)**

Do the Team Leaders meet the requirements in paragraph 650.309 (b) and 650.313(g)?

Notes from Metric Review

- Review of this Metric is subject to all Team Leaders doing inspections in Michigan
- List used by FHWA was from the Michigan Bridge Inspection System (598 Users), Sample size (18) (Bridge Owners & Inspectors)

Criteria for Review

5 Ways to Qualify as a Team Leader (QTL).

Must complete an FHWA Approved Inspection course and meet one of the following:

Summary of 650.309(b)

1. Be a registered professional engineer;
2. Have (5) years of bridge inspection experience (Note this has to be documented)
3. Have all of the following:
   - Bachelor's degree in engineering, successfully passed the Engineering and Surveying Fundamentals of Engineering exam, and (2) years of Bridge inspection experience.
4. Be certified as a Level III or IV Bridge Safety Inspector under National Certification in Engineering Technologies (NICET);
5. Have all of the following:
   - Associate's degree in engineering or engineering technology and (4) years of experience

Metric 3: **Qualifications of personnel – Team Leader(s)**

Must also meet 650.313.(g) Recurrent Training

States have responsibility to set recurrent training requirements

MICHIGAN Recurrent Training Requirements in a 5 Year Period

- NHI 130053 Bridge Inspection Refresher
- NHI 130078 Fracture Critical Inspection Techniques for Steel Bridges
- NHI-130091 Underwater Bridge Inspection

Or

- **24 Hours of approved bridge inspection training**

Metric 3: **Qualifications of personnel – Team Leader(s)**

Examples for 24 Hours of approved bridge inspection training

NHI 135047 – Stream Stability and Scour at Highway Bridges for Bridge Inspectors

NHI 130099 – Bridge Inspection Non-Destructive Evaluation Showcase

NHI-134029 – Bridge Maintenance Training

Michigan Bridge Conference – Bridge Inspection Workshop

Michigan Bridge Conference – Load Rating Workshop

Center for Technology & Training – 2012 Load Rating Training

and . . .

other training as approved by the Bridge Inspection Program Manager

Note: Intent of the 24 hours of recurrent is to include a diversified amount of training which not only includes specific types of structures, specific design details, and inspection procedures, but also to have reference to the NBIS and NBI Ratings.

Metric 3 Finding: Compliant

Metric 4: **Qualifications of personnel – Load Rating Engineer**

Does the individual responsible for load ratings meet the requirement of paragraph 650.309 (c)?

FHWA Reviewed Qualifications of MDOT's Load Rating Engineer

Brad Wagner, P.E.
Bridge Load Rating Program Manager
MDOT Bridge Management Section
Phone: (517) 322-1186
e-mail: wagnerb@michigan.gov

NHI 130081A	LRFD for Highway Bridge Superstructures - Steel
NHI 130081	LRFD for Highway Bridge Superstructures - Concrete
NHI 130092	Fundamentals of LRFR and Applications of LRFR for Bridge Superstructures
NHI 130095A	Fundamental and Structural Analysis for Curved and Skewed Steel Bridges

Metric 4 Finding: Compliant

Metric 5: **Qualifications of personnel – UW Bridge Inspection Diver**

Does the underwater bridge inspection diver(s) reviewed meet the requirements of paragraph 650.309 (d)?

Criteria: Divers completing the inspection must complete FHWA Approved inspection training:

NHI 130055 Safety Inspection of In-Service Bridges

NHI 130091 Underwater Bridge Inspection

FHWA reviewed qualifications for (9) divers for this metric.

Metric 5 Finding: Compliant

Note:

Team Leader has to be on site during the inspection. Team Leader can act in dual role. (Diver and QTL)

Summary: Qualifications of Personnel **Metrics 2-5: Compliant**

KEEP Your Certificates

MDOT
Michigan Department of Transportation

BRIDGE ADVISORY
Construction &Technology Division
Bridge Operations Section

BRIDGE ADVISORY NUMBER: BA-2011-03 **DATE:** May 16, 2011

SUBJECT: Credentials for all Qualified Team Leaders

ISSUED BY: Rich Kathrens, Bridge Safety Inspection Engineer

REVIEWED BY: Dave Juntunen, Bridge Operations Engineer

Contact Information: Rich Kathrens, Bridge Safety Inspection Engineer, (517) 322-5715 or kathrensr@michigan.gov

The NBIS regulations define the qualifications for team leaders, underwater bridge inspection divers, and individuals charged with completing load ratings. To ensure these individuals meet the NBIS requirements, all MDOT and Local Agency bridge owners are required to maintain a file which contains credential information for each inspector completing inspection for their structures.

2012 Bridge Inspection Workshop

Additional procedures to ensure team leaders are qualified:

- Team Leaders must enter inspection reports into MBIS
- Team Leaders must update their MBIS User Profile to provide QTL Information
- Quality Assurance Reviews are checking files for Qualifications

Non-NBI Structures (10'-19' Spans, Pedestrian, RR)

- May be inspected and entered into MBIS by non QTL
- Must have adequate QC policy to review reports and ratings

Metrics 6-11 Inspection Frequency

2011 FHWA METRICS (2010 Data Review)

	METRIC	DESCRIPTION	STATUS	ACTION
INSPECTION FREQUENCY	6	Inspection frequency Routine	Condition Compliant	PCA_2011_M6
	7	Inspection frequency Routine Extended	Compliant	
	8	Inspection frequency Underwater	Condition Compliant	PCA_2011_M8
	9	Inspection frequency Underwater Extended	Compliant	
	10	Inspection frequency Fracture Critical Member	Condition Compliant	PCA_2011_M10
	11	Inspection frequency Damage, In-depth or Special	Substantial Compliant	IP_2011_M11

Metric 6: **Inspection frequency – Routine**

Have all bridges been inspected at regular intervals not exceeding 24 months? Have criteria to determine level and frequency for which bridges that require inspection at less than 24 months been established? 650.311 (a)(1)&(2)

Criteria: Part 1 – Timeliness

Part 2 – Criteria for inspecting bridges less than 24 months

Part 1 – Timeliness

FHWA Generated "Frequency Interval Reports" based data submitted in April 2011

Timeliness Review: Subject to all bridges meeting criteria and a random sample size. (State and Local combined)

Breakdown of Categories

SD, P, R: Structurally Deficient, Load Restricted (Item 41 – P or R)
All other Bridges

Metric 6: **Inspection frequency – Routine**

Metric 6 - Inspection Frequency - Routine State: **MICHIGAN**

Frequency Interval Report Date: **August 2011**

Summary Year of latest NBI data used in analysis: **2011**

	Metric Compliance Definitions			Metric Compliance Summary		
Category Interval Criteria	**Compliance Criteria**	**Substantial Compliance Criteria**	**Non-Compliance Criteria**	**Number Meeting Interval Criteria**	**Total Number of Bridges in Category**	**Percent Meeting Interval Criteria**
1 - SD, P, R Bridges <= 25-mo interval	= 100%	NA	< 100%	1,642	1,796	**91.4%**
2 - All other Bridges <= 25-mo interval	= 100%	>= 98%	< 98%	8,109	8,774	**92.4%**
3 - All other Bridges > 28-mo interval	= 0%	NA	> 0%	143	8,774	**1.6%**
				Total Number of Bridges (lines 1+2 only):	**10,570**	

Metric 6: **Inspection frequency – Routine**

Part 2 – Criteria for inspecting bridges less than 24 months

GUIDELINES FOR BRIDGE INSPECTION FREQUENCIES
Bridge Operations Section, C & T Division
February 2002

The maximum frequency between "Routine" bridge inspections allowed by NBIS is 24 months. Often it is prudent to decrease that frequency if circumstances warrant. The list below is offered as a reference for bridge inspectors to maintain consistency statewide. It is recognized that each bridge is a unique situation and the inspector must understand the how the bridge is behaving over time and set the next inspection date accordingly.

No	ELEMENT OR BRIDGE TYPE	FREQUENCY (Mos.) < 6	6 to 9	9 to 15	LOAD ANALYSIS (1)	COMMENTS (2)
1	**Posted Bridges**					
	Design Deficient			X		Verify with Design
	Structural Deterioration	X	X		X	Change in condition will warrant re-analysis
2	**Bridges 25 Years or Older**					
	Bridge has Original Deck / Superstructure					Schedule first "Detail" inspection
3	**Bridge Decks**					
	Deck Rated 4					Notify bridge foreman to monitor deck.
	Deck Rated 3			X		If necessary, scale underside of deck.
4	**Steel Superstructure**					
	Section loss evident but amount not known.					Schedule "Detail" inspection

Metric 6 Finding: Conditional Compliant

Metric 7: **Inspection frequency – Routine Extended**

If FHWA approval has been granted for extended inspection interval, are bridges being inspected in accordance with the approved criteria? Are controls in place to ensure sustained compliance with the approved criteria? 650.311 (a)(3)

Michigan does not have structures meeting this criteria.

Michigan Law current prevents extending inspections beyond 24 months.

BRIDGES AND CULVERTS (EXCERPT)
Act 354 of 1925

254.19a Biennial inspection of bridges; plan.

Sec. 19a.

The state transportation department shall institute a systematic plan of biennial inspection of all bridges under its jurisdiction.

Metric 7 Finding: Compliant

Metric 8: **Inspection frequency – Underwater**

Have all bridges requiring underwater inspections been inspected at regular intervals not exceeding 60 months? Have criteria to determine level and frequency for which bridges that require underwater inspections at less than 60 months been established? 650.311 (b)(1) & (2)

Breakdown of Categories

Metric 8 Finding: Conditional Compliant

SC, Sub<=4: Scour Critical, Substructure Rating 4 or less
All other Bridges

Metric 8 - Inspection Frequency - Underwater State: **MICHIGAN**

Frequency Interval Report Date: **September 2011**

Summary Year of latest NBI data used in analysis: **2011**

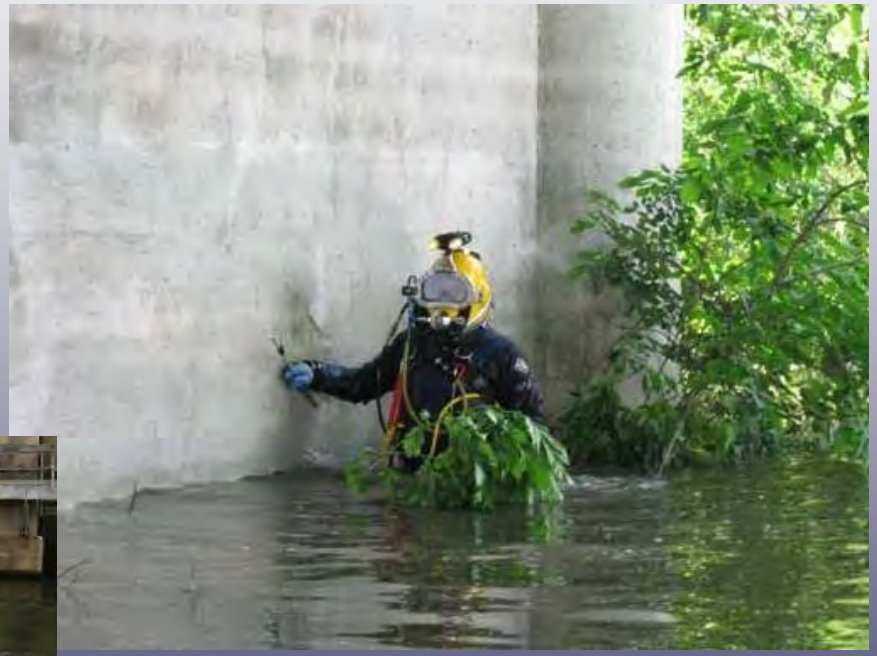
	Metric Compliance Definitions			Metric Compliance Summary*		
Category Interval Criteria	**Compliance Criteria**	**Substantial Compliance Criteria**	**Non-Compliance Criteria**	**Number Meeting Interval Criteria**	**Total Number of Bridges in Category**	**Percent Meeting Interval Criteria**
1 - SC, Sub <= 4 <= 61-mo interval	= 100%	NA	< 100%	68	78	**87.2%**
2 - All other Bridges <= 61-mo interval	= 100%	>= 98%	< 98%	57	95	**60.0%**
3 - All other Bridges > 64-mo interval	= 0%	NA	> 0%	29	95	**30.5%**
			Total Number of Bridges (lines 1+2 only):		**173**	

* Metric compliance summary analysis limited to underwater inspections that occurred in 2009 or later.

Metric 9: **Inspection frequency – Underwater Extended**

If FHWA approval has been granted for extended underwater inspection interval, are bridges being inspected in accordance with the approved criteria? Are controls in place to ensure sustained compliance with the approved criteria? 650.311 (b)(3)

Michigan does not have structures meeting this criteria.



Metric 9 Finding: Compliant

Metric 10: **Inspection frequency – Fracture Critical Member**

Have all FCMs been inspected at regular intervals not exceeding 24 months? Have criteria to determine level and frequency for which FCMs that require inspections at less than 24 months been established? 650.311 (c)(1) & (2)

Breakdown of Categories

SD, P, R: Structurally Deficient, Load Restricted

All other Bridges

Metric 10 Finding: Conditional Compliant

Metric 10 - Inspection Frequency - Fracture Critical Member Frequency Interval Report

State: **MICHIGAN**

Date: **August 2011**

Summary

Year of latest NBI data used in analysis: **2011**

	Metric Compliance Definitions			Metric Compliance Summary		
Category Interval Criteria	**Compliance Criteria**	**Substantial Compliance Criteria**	**Non-Compliance Criteria**	**Number Meeting Interval Criteria**	**Total Number of Bridges in Category**	**Percent Meeting Interval Criteria**
1 - SD, P, R Bridges <= 25-mo interval	= 100%	NA	< 100%	22	27	**81.5%**
2 - All other Bridges <= 25-mo interval	= 100%	>= 99%	< 99	70	85	**82.4%**
3 - All other Bridges > 28-mo interval	= 0%	NA	> 0%	10	85	**11.8%**
			Total Number of Bridges (lines 1+2 only):		**112**	

Metrics- 6-10: **Inspection frequency**

Summary for Metrics 6, 8, and 10 (Generally had the same issues)

Each metric initially found to be Non-Compliance (NC) based on entire inventory.

Have to be near perfect for Metrics 8 and 10 (Small Sample Size)

(1) Late inspection for a Structurally Deficient Structures results in NC

Current Procedures for Checking Compliance

MDOT Runs a compliance check every 2 Months (Jan, Mar, Jul, etc)

- Compliance report is checking structures that are currently 30 days past due (Each type of Inspection)
- Notifications are sent to bridge owners. (Typically this resolves the issue of a past due inspection)
- Once an agency has reached 60 days past due, placed in Non-Compliance. (Federal Funds will be withheld)

Metrics- 6-10: **Inspection frequency**

Plan of Corrective Action (PCA_MDOT_2011_M6, M8, M10)

1. MDOT will provide advance notifications to bridge owners and **previous inspectors** for number of inspections due in the next 3 months.

The number of bridges in your jurisdiction that are scheduled for inspections within the next **THREE** months are shown below:

MONTH	R	FC	FS	UW	OS
OCTOBER	1	0	0	0	0
NOVEMBER	0	0	0	0	0
DECEMBER	2	0	0	0	0

LEGEND

R= Routine
FC= Fracture Critical
FS = Fatigue Sensitive
UW = Underwater
OS = Other Special

2. Provide automated notifications to bridge owners for past due inspections. (Note: this is simply a database check)

Metrics- 6-10: **Inspection frequency**

PCA M6, M8, M10 Performance Reporting

MDOT to Provide Timeliness Reports to:

- MDOT Senior Management
- County Road Association of Michigan
- Michigan Municipal League
- FHWA Division Bridge Engineer

MDOT Routine Inspection Summary March 2012

Region	Number of Bridges		Routine Inspection Timeliness December 1, 2011 to February 29, 2012						Overdue At Time of Query		Inspection Due Next 3 Months	
			Total Bridges			With False Decking						
	Total	w/ False Decking	Late	On Time	% On Time	Late	On Time	% On Time	Total	w/ False Decking	Total	w/ False Decking
Superior	302	1	0	2	100.0%	0	0	N/A	0	0	17	0
North	335	0	0	58	100.0%	0	0	N/A	0	0	20	0
Grand	595	11	0	9	100.0%	0	0	N/A	0	0	69	3
Bay	678	33	0	80	100.0%	0	6	100.0%	1	0	83	3
Southwest	494	8	0	1	100.0%	0	0	N/A	0	0	56	0
University	777	11	0	3	100.0%	0	0	N/A	0	0	105	0
Metro	1,186	148	0	134	100.0%	0	21	100.0%	1	0	173	37
Big Bridges	36	1	0	0	N/A	0	0	N/A	0	0	5	0
Statewide	**4,403**	**213**	**0**	**287**	**100.0%**	**0**	**27**	**100.0%**	**2**	**0**	**528**	**43**

Metric 11: **Inspection frequency – Damage, In-depth or Special**

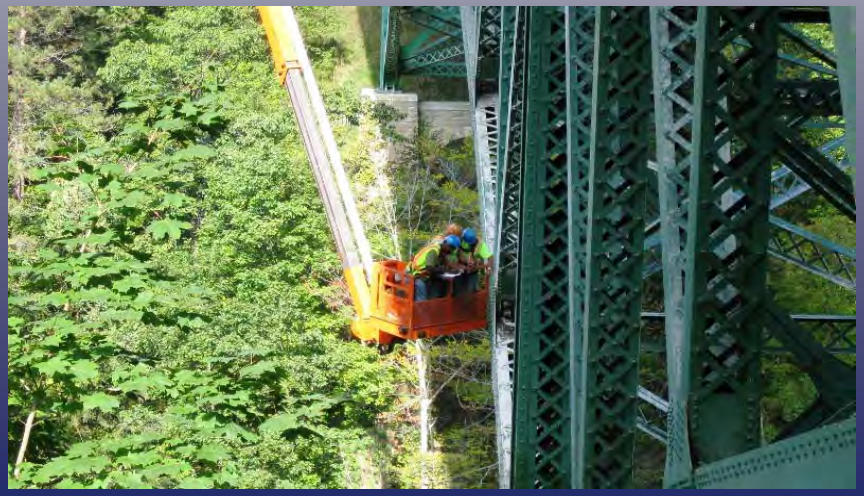
Have criteria to determine level and frequency for these inspections been established? 650.311 (d)

Review of this Metric focused in on inspection type: Other, Special (Item 92C)

Other, Special Inspection

- Performed to monitor conditions of specific elements
  - Abutment Tilt/Settlement
  - Temporary Supports
  - Monitor damage

- Do not require a Team Leader
- Frequency is subject to Timeliness and Compliance



Metric 11: **Inspection frequency – Damage, In-depth or Special**

Review exposed many data errors with Item 92 – Other, Special

- Many of the Data errors were fixed, but final determination showed the need to provide additional guidance for the use of this type of inspection.
  - Errors included coding UW Inspections, Not updating Item 92 after need for other special has ended.

Metric 11 Finding: Substantial Compliant

Metric 11: **Inspection frequency – Damage, In-depth or Special**

IMPROVEMENT PLAN (IP_MDOT_2011_M11)

1. Develop interim guidance through the use of MDOT's Bridge Advisory procedures
2. Provide automated messages to Bridge Owners for next 3 months and past due Other, Special Inspections

IP M11 - Performance Reporting

MDOT to Provide Timeliness Reports to:

MDOT Senior Management
County Road Association of Michigan
Michigan Municipal League
FHWA Division Bridge Engineer

MDOT Michigan Department of Transportation

2011 NBIP Review
Improvement Plan
Metric 11

PCA No: IP_MDOT_2011_M11 January 12, 2012

SUBJECT: METRIC 11 – Inspection Frequency, Damage, In-depth, or Special

ISSUED BY: Richard Kathrens, Bridge Inspection Program Manager

REVIEWED BY: Eric Burns, Structures Management Engineer

Metric 11: Inspection Frequency, Damage, In-depth, and Special, 23 CFR 650.311(d)

As a result of the 2011 National Bridge Inspection Program review, FHWA has determined that MDOT did not meet the requirements of 23 CFR 650.311(d). The NBIP review for this metric revealed several discrepancies with the collection of data for Item 92C and 93C (Other Special Inspection).

OBJECTIVE

To perform all damage, in-depth and special inspections within the identified inspection frequencies.

CORRECTIVE ACTIONS

1. MDOT will provide guidance for coding Item 92, Critical Feature Inspection, which will further define special inspections and designated inspection frequencies.

   a. Interim guidance will be provided using MDOT's Bridge Inspection Advisory

Metrics 12-21 Inspection Procedures

2011 FHWA METRICS (2010 Data Review)

	METRIC	DESCRIPTION	STATUS	ACTION
INSPECTION PROCEDURES	12	Inspection procedures Team Leader	Compliant	
	13	Inspection procedures Load Rating	Conditional Compliant	PCA 2008
	14	Inspection procedures Post or Restrict	Substantial Compliant	IP_2011_M14
	15	Inspection procedures Bridge Files	Conditional Compliant	PCA_2011_M15
	16	Inspection procedures Fracture Critical Members	Conditional Compliant	PCA_2011_M16
	17	Inspection procedures Underwater	Compliant	
	18	Inspection procedures Scour Critical Bridges	Compliant	
	19	Inspection procedures Complex Bridges	Compliant	
	20	Inspection procedures QC/QA	Substantial Compliant	IP_2011_20
	21	Inspection procedures Critical Findings	Conditional Compliant	PCA_2011_M21

Metric 12: **Inspection procedures – Team Leader**

Is one team leader, who meets the minimum qualifications stated in 650.309 (b) and 650.313 (g), at the bridge at all times during each initial, routine, in-depth, fracture critical member and underwater inspection?

Metric Criteria: Required MDOT to provide inspection rates and their NBIS qualifications

Wait! We checked Qualifications in Metrics 2-5

Different subset of Team Leaders (Based on Random Sample from Routine Inspections)

Inspection Rates/Day – 10 (Best Practice)

Above 10 per day, subject to more intense review and validity of reports.

Metric 12: **Inspection procedures – Team Leader**

Be prepared to provide documentation when number of inspections exceed 12 per day.

Metric 12 Finding: Compliant

Metric 13: **Inspection procedures – Load Rating**

Has each bridge been rated to its safe load carrying capacity in accordance with the AASHTO Manual? 650.313 (c)

A truck is seen in a hole after part of the structure of a bridge collapsed into a river in Changchun, Jilin province May 29, 2011. Two truck passengers were injured, while the cause of the accident is still under investigation, local media reported. Picture taken May 29, 2011.

Metric Previously Evaluated in 2008 NBIP Program Review

Metric 13 Finding:
Conditional Compliant

Metric 13 Impacts several other metrics:

- Metric 14: Post or Restrict
- Metric 15: Bridge Files
- Metric 20: QA/QC

Metric 14: **Inspection procedures – Post or Restrict**

Have all bridges been posted or restricted in accordance with the AASHTO Manual or in accordance with State law, when the maximum unrestricted legal loads or State routine permit loads exceed that allowed under the operating rating or equivalent rating factor? 650.313 (d)

Load Rating and Posting		
31- Design Load	5	
41- Open, Posted, Closed	P	
63- Oper Rtg Method	1	
64F- Fed Rtg Method	52.5	
64M- Mich Oper Rtg	9	69
65- Inv Rtg Method	1	
66- Inventory Load	31.5	
70- Posting	3	
141- Posted Loading	426572	
195- Analysis ID		
193- Overload Class		N

- Metric 14 Review includes reviewing data for load rating items as well as verifying that recommended load posting is at bridge site.
- Accurate Load Ratings and Proper Coding will fix data errors.

Metric 14: **Inspection procedures – Post or Restrict**

A random list of bridges was generated for structures that require posting (18 Structures were selected, all Local Agency)

(1) Structure did not have a sign in place
(1) Structure did not have the sign updated when the load rating was lowered
(2) Structures had been reconstructed and the SI&A not correctly updated.

Review of 2010 data for Item 41 Open, Posted, Closed

(56) Structures were coded "B"
"Open, posting recommended but not legally implemented"

(287) Structures with Superstructure condition ratings less than 4 indicating a load rating and possible posting is needed.

Metric 14 Finding: Substantial Compliant

Note: Finding of (SC) mainly based on fixing data errors and implementing improvement plan

Metric 14: **Inspection procedures – Post or Restrict**

		Sign in Place
41	P (Posted)	
141	Posted Loading **42/64/72**	X

IMPROVEMENT PLAN (IP_MDOT_2011_M14**)**

In addition to the PCA for Metric 13, Load Rating

- MDOT will provide inspector verification fields on the BSIR to verify that recommended posting sign is in place.
- MDOT will provide warning and error notifications during the data entry process for load ratings.
- MDOT will develop automated notifications to bridge owners when Item 41 is Coded B.

Metric 14: **Inspection procedures – Post or Restrict**

MDOT requires a copy of the current load posting photo.

Local Agencies should send a copy of the bridge posting to:

Craig Russell, Engineering Technician Specialist
MDOT, C&T Secondary Complex
8885 Ricks Road
Lansing, MI 48854
517-322-1584
e-mail: russellc@michigan.gov

Note: Please attach the photo of the load posting with the bridge in the background to a copy of the SI&A form.

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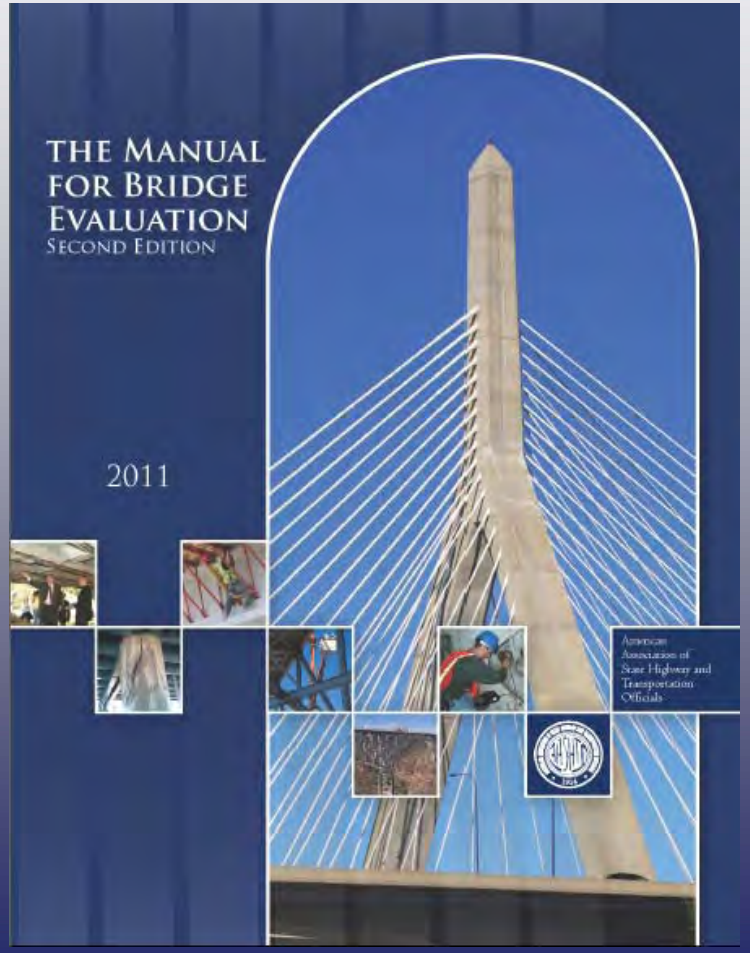
Metric 15: **Inspection procedures – Bridge Files**

Have bridge files been prepared as described in the AASHTO Manual i.e., maintain reports on the results of bridge inspections together with notations of any action taken to address the findings of such inspections, maintain relevant maintenance and inspection data to allow assessment of current bridge condition, and record the findings and results of bridge inspections on standard forms.



Metric Review Criteria

- Inspection History
- SI&A Sheets
- Plans
- Bridge Load Rating
- Photographs
- Maintenance & Repair History
- Hydraulic Data

Reviewed random bridge files from random sample generated during the Review of Metric 6

Compliant if 90% of the bridge files contained the above information

Metric 15 Finding: Conditional Compliant

Metric 15: **Inspection procedures – Bridge Files**

AASHTO Subcommittee on Bridges and Structures

AASHTO T-18 is currently reviewing Section 2 Bridge Records of MBE as part of the 2012 AASHTO Ballot

(FHWA is proposing stronger language for the content of the file)

Example

2.1—GENERAL

Bridge Owners ~~should~~ must maintain a complete, accurate, and current record of each bridge under their jurisdiction. Complete information, in good usable form, is vital to the effective management of bridges. Furthermore, such information provides a record that

Metric 15: **Inspection procedures – Bridge Files**

Plan of Corrective Action (PCA MDOT 2011 M15)

1. After changes proposed by 2012 AASHTO Ballot, MDOT will issue a Bridge Advisory providing guidance for bridge file information.
2. MDOT will develop a Bridge Inspection Manual to describe specific procedures for maintaining Bridge Files.
3. MDOT will continue to verify the completeness of Bridge files during MDOT's Quality Assurance Reviews.

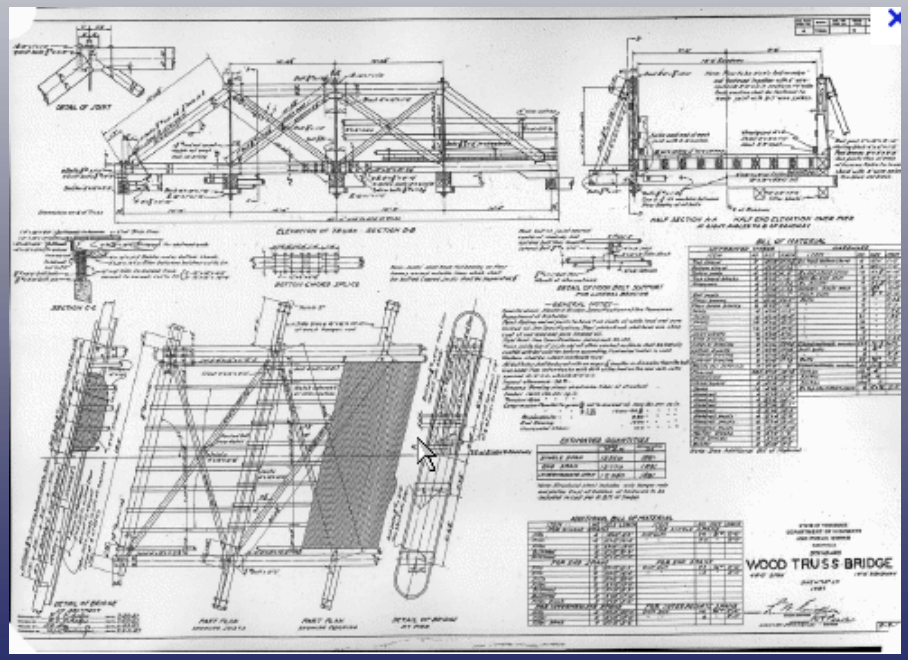
Metric 15: **Inspection procedures – Bridge Files**

Comments regarding Bridge files.

- Bridge Information to be stored in (1) file, per bridge
- Bridge information not in the file should cross referenced
- Bridge file should be maintained for the life of the structure

In addition to individual Bridge Files:

- Qualifications Files
- QA/QC Procedure File



Metric 16: **Inspection procedures – Fracture Critical Members**

Are the location of FCMs identified and the FCM inspection frequency and procedures described in the inspection records for each bridge requiring a fracture critical member inspection? Are FCMs inspected according to these procedures? 650.313 (e)(1)

Metric reviewed structures that were coded Y for Item 92A, Fracture Critical Details.

Sample size 16 out 112 structures

Criteria for Compliance:

100% of files reviewed have FCM's identified and structure specific procedures described

Substantial Compliance:

95% of files reviewed have FCM's identified and structure specific procedures described

Metric 16: **Inspection procedures – Fracture Critical Members**

Metric 16 Review results:

7 Structures had Procedures and Drawings

This results in only (44%) meeting criteria.

Metric 16 Finding: Conditional Compliant

Fracture Critical Inspection

Hands on inspection of FCM's and Details

FCM – Steel, Tension, Non-Redundant

Team leader for routine Inspection must review FC Report when making overall assessment of condition for NBI Rating

Metric 16: **Inspection procedures – Fracture Critical Members**

MICHIGAN DEPARTMENT OF TRANSPORTATION

FRACTURE CRITICAL INSPECTION REPORT [SIA #92-A]

MDOT Bridge ID	Structure Number	Control Section
17 1170320000000B02	1570	B02-17032

Facility	Federal Struc ID	Inspector Name	Agency Name	Inspection Date
I-75 BS (ASHMUN)	171170320000B020	Louis Taylor		07/12/2011

Feature	Latitude	Longitude	Insp Freq	Insp Key
POWER CANAL	462943.58	842057.48	15	HOTA

Location	Length	Width	Year Built	Yr Recon	Material	Design	Scour Eval	# of Pins
IN SAULT STE MARIE	256.9	62.01	1934	1998	3	12	8	0

-

SPAN CONFIGURATION

Bridge Type	12 Arch- Thru	Appr Span Type	
Main Span	Y	Appr Span	
# of Main Spans	1	# of Appr Span	0
Lanes On	3	Lanes Under	0
47L-Left Horizontal Clear (ft)	0.0	47R-Left Horizontal Clear (ft)	53.81
54B-Left Underclearance (ft in)	18ft 4in	54D-Right Underclearance (ft in)	18ft 4in

NBIS RATINGS & COMMENTS (Latest Inspection Ratings Transferred from BSIR)

Stringer (SIA-59): 6 Paint '99 but heavy LOS remains in floor bms & stringers. Repairs made to stringers 2E & 13E @ floor bm 4S & 7S in '03. Hole in W fascia, center connection - No live load concerns. Large area of loss behind N pin plate on W long. member.

Paint (SIA-59A): 7 Painted 6-99-4. Small areas of paint peeling and rust stains, some touched up.

FRACTURE CRITICAL ELEMENTS

FC Element

Floor Beam Connections

Element Location

Located at every Hanger

Inspection Comments

(11) - Good. The pinned wind chord connections are also framed into this area. There is mild to heavy section loss of the gusset and steel for the wind chord at the connection

Intent of MDOT FC Report

Define FC Members

Describe Location

Describe Condition

Provide Recommendations

Describe Access Equipment

Document electronically so routine inspector can access easily.

Metric 16: **Inspection procedures – Fracture Critical Members**

Plan of Corrective Action (PCA MDOT 2011 M16)

1. MDOT will develop a Bridge Inspection Manual to describe specific procedures for identifying and inspecting fracture critical members.
2. MDOT will identify bridges that potentially have FCM's by reviewing Structure Type and Span Design Type (Item 43 or 44)

ITEM 43A	ITEM 43B
03 Steel	03 Girder & Floor Beam – Deck Non Composite
04 Steel Continuous	33 Girder & Floor Beam – Composite Girder
08 Aluminum	25 Girder – Thru
	09 Truss - Deck
	10 Truss – Thru & Pony
	12 Arch - Through
	13 Suspension
	14 Stayed Girder
	15 Movable - Lift
	16 Movable - Bascule
	17 Movable – Swing

Metric 16: **Inspection procedures – Fracture Critical Members**

MDOT Contact for Fracture Critical

Lou Taylor, P.E
Movable Bridge/Fracture Critical Engineer
(517) 322-6092
taylorl5@michigan.gov

MDOT Contact for Fatigue Sensitive

Kelley Davis, P.E
Fatigue Sensitive Engineer
(517) 322-6796
davisk2@michigan.gov

Metric 17: **Inspection procedures - Underwater**

Are the location of underwater elements identified and the underwater elements, the inspection frequency, and the procedures described in the inspection records for each bridge requiring an underwater inspection? Are those elements requiring underwater inspections inspected according to these procedures? 650.313 (e)(2)

Metric is reviewing Underwater Inspection Procedures

Typically underwater inspections are contracted diving firm.

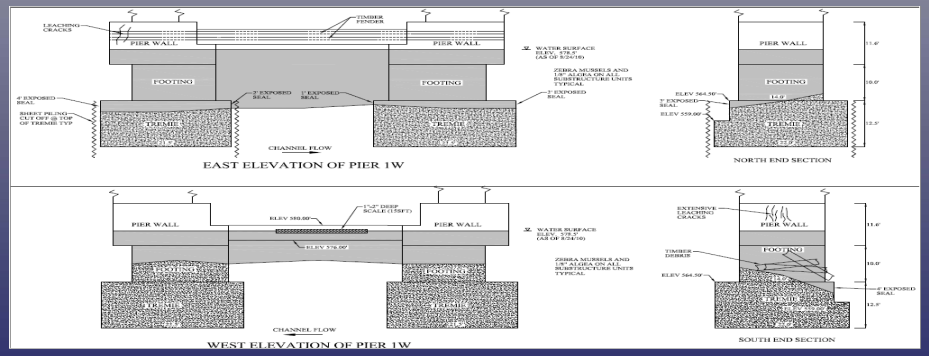
Standard Request for Proposal which details qualifications of UW Team, with references to AASHTO, FHWA, OSHA, etc.

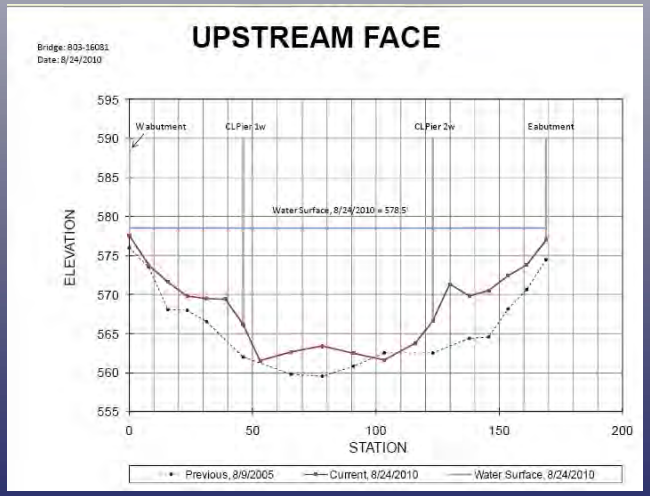
Reports: MBIS Provides Summary, A more detailed report is typically provided as part of the contract which includes:

Methods and Procedures for inspection of UW elements

Stream Cross Sections and Soundings

Substructure elevation drawings.





Metric 17: **Inspection procedures - Underwater**

287 Structures: Coded Y for Item 92B Underwater Inspection required

Sample size for review = 18 (11 State and 7 Local Agency)

Qualifications and Reports were reviewed for theses 18 structures

All bridges in this sample met the requirements for this metric.

Metric 17 Finding: Compliant

Proposed NBI Ratings*	
Item #60, Abut:	6
Item #60, Pier:	6
Item #61:	7
Item #71:	9
Item #111:	2
Item #113:	3 (observed)

* Based on underwater inspection only

Comments on Metric 17

UW Inspections are typically completed when water depths are approaching 10' in depth

Item 92B should only be coded Y when Item 176 Underwater Inspection Method is coded (3) Diver Required

Team Leaders for the Routine Inspection are required to review the UW Report to make assessment of ratings

Metric 18: **Inspection procedures – Scour Critical Bridges**

Has a plan of action (POA) been prepared to monitor known and potential deficiencies and to address critical findings? Have bridges that are scour critical been monitored in accordance with the plan? 650.313 (e)(3)

Do all Scour Critical Bridges have Plan of Action (POA)

Compliance – 100% (There is no Substantial Compliance)

MDOT was working from an approved Plan of Corrective Action to have all structures evaluated for Scour by Dec. 2010 and to have all Scour POA's completed by Dec. 2011

Metric 18 Finding: Compliant

MDOT Michigan Department of Transportation

BRIDGE ADVISORY
Construction &Technology Division
Bridge Operations Section

BRIDGE ADVISORY NUMBER: BA-2008-05 **DATE**: September, 9, 2008

SUBJECT: Plan of Action Report for Scour Critical Bridges in the Michigan Bridge Inspection System (MBIS)

ISSUED BY: MDOT Bridge Operations Engineer

Contact Information: David Juntunen, Bridge Operations Engineer, 517-322-5688 or juntunend@michigan.gov

Effective August 26, 2008, a special inspection report called "Scour Action Plan" was added to the Michigan Bridge Inspection System (MBIS). All bridge owners are asked to fill out this report for

Metric 18: **Inspection procedures – Scour Critical Bridges**

Scour Plan of Action are live documents

- Continue to review and update POAs. Make sure follow-up is occurring during "triggers" listed in POA's
- Future Reviews will determine compliance by adhering to POA

Evaluating Scour Criticality (Item 113) can be determined by both

- Calculated (Level I and II Analysis)
- Observed (Field Inspection)

Example

Calculated Scour : 113 = 5

Field Inspection: 113 = 2

Metric 19: **Inspection procedures – Complex Bridges**

Have specialized inspection procedures, and additional inspector training and experience required to inspect complex bridges been identified? Are complex bridges inspected according to those procedures? 650.313 (f)

Complex bridges include:

- Moveable
- Suspension
- Cable Stayed
- Any other bridge with unusual characteristics

Michigan has 25 Structures meeting this criteria

Sample Size for this Metric = 11 (7 MDOT, 4 Local Agency)

Metric 19: **Inspection procedures – Complex Bridges**

FHWA Reviewed files, detailed reports, and scope of services for the 11 random selected structures.

- MDOT Utilizes both in-house staff and consultant contracts to perform the inspections and management of these structures
- Local Agencies typically use consultant contracts
- For Detailed Inspection Contracts – Scope of Services and Report detailed structure specific inspection procedures

Metric 19 Finding: Compliant

Metric 19: **Inspection procedures – Complex Bridges**

Resources for assistance with Complex Structures

MDOT – Design

Jose Garcia, Special Structures	(517) 373-0075	garciaj@michgan.gov

MDOT – Structures Management

Eric Burns, Structures Management Engineer	(517) 322-3326	burnse@michigan.gov
Jason DeRuyver, Region Support Engineer	(517) 750-0423	deruyverj@mcihgan.gov
Christopher Idusuyi, Statewide, Structures	(517) 322-3300	idusuyic@michigan.gov
Lou Taylor, Movable Bridge/Fracture Critical Engineer	(517) 322-6092	taylorlo@michigan.gov
Kelly Davis, Fatigue Sensitive Engineer	(517) 322-6796	davisk2@michigan.gov

Prequalified Consultants: www.michigan.gov/mdot
- Complex Bridges
- Movable Bridge Design

Metric 20: **Inspection procedures – QC/QA**

Are systematic quality control (QC) and quality assurance (QA) procedures used to maintain a high degree of accuracy and consistency in the inspection program? Are periodic field review of inspection teams, periodic bridge inspection refresher training for program managers and team leaders, and independent review of inspection reports and computations included in the procedures? 650.313 (g)

Metric Criteria:

Documented QC/QA policies and procedures. Percent of periodic field reviews of inspection teams documented. Percent of staff receiving refresher training. Percent of inspection reports and **load rating** computations sampled.

Random Selection was based on Metric 6 Structures (Routine Inspections)

MDOT Submitted QA\QC Procedures and for both to FHWA for Review (Included Consultant QC Procedures)

Findings:

The only component of this metric not able to be confirmed is the load rating calculations as addressed in Metric 13:

95% of the bridges had been load rated, 72% had the calculations in the file, and 67% of the calculations matched the SI&A sheets

Metric 20 Finding: Substantial Compliant

Metric 20: **Inspection procedures – QC/QA**

BRIDGE SAFETY INSPECTION
QUALITY CONTROL & QUALITY ASSURANCE REQUIREMENTS

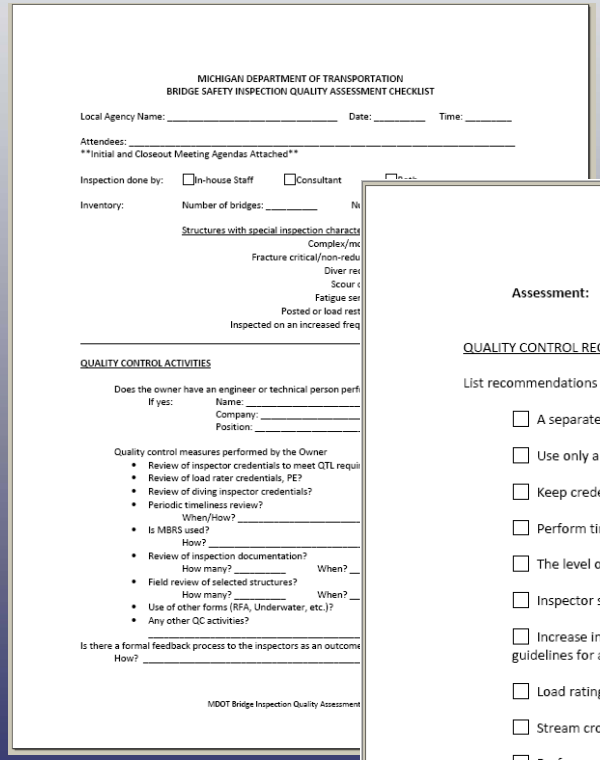
To meet these requirements, for QC, the following must be done as a minimum:

1. Each unit must have an independent review of 10% of the inspections done each year. If the unit has less than 10 NBI bridges in their network, they must have the QC performed every third inspection cycle.
2. The review must be done by a qualified team leader who did not do the inspection in that cycle.
3. The reviewer must check all paperwork required for the given structure inspection and confirm that the review has been satisfactorily completed by placing their name (signature) and date in the bridge file.
4. Field verification of the conditions stipulated on the report must be done for the files reviewed.
5. Load rating calculations must be reviewed by a registered professional engineer.
6. Each unit must maintain a Bridge Safety Inspection QC file with documentation related to activities and communication performed during the QC reviews.

Metric 20: **Inspection procedures – QC/QA**

To meet the requirements of the program for QA:

MDOT will perform QA reviews of 10% of bridge owner units every year. The QA reviews performed by MDOT (or their consultant) will check QC procedures in each unit and review 5% of the total network for that unit.



MICHIGAN DEPARTMENT OF TRANSPORTATION
BRIDGE SAFETY INSPECTION QUALITY ASSESSMENT CHECKLIST

Local Agency Name: _____ Date: _____ Time: _____

Attendees: _____
Initial and Closeout Meeting Agendas Attached

Inspection done by: ☐In-house Staff ☐Consultant

Inventory: Number of bridges: _____

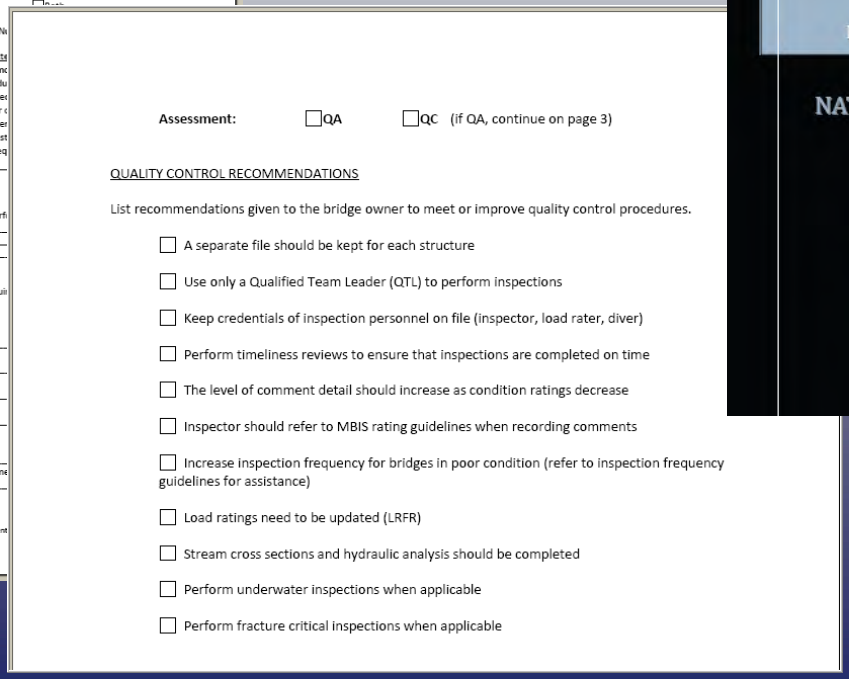
QUALITY CONTROL ACTIVITIES

Does the owner have an engineer or technical person perfi
If yes: Name: _____
Company: _____
Position: _____

Quality control measures performed by the Owner
- Review of inspector credentials to meet QTL requi
- Review of load rater credentials, PE?
- Review of diving inspector credentials?
- Periodic timeliness review?
  When/How? _____
- Is MBRS used?
  How? _____
- Review of inspection documentation?
  How many? _____ When? __
- Field review of selected structures?
  How many? _____ When? __
- Use of other forms (RFA, Underwater, etc.)?
- Any other QC activities?

Is there a formal feedback process to the inspectors as an outcome
How? _____

MDOT Bridge Inspection Quality Assessment

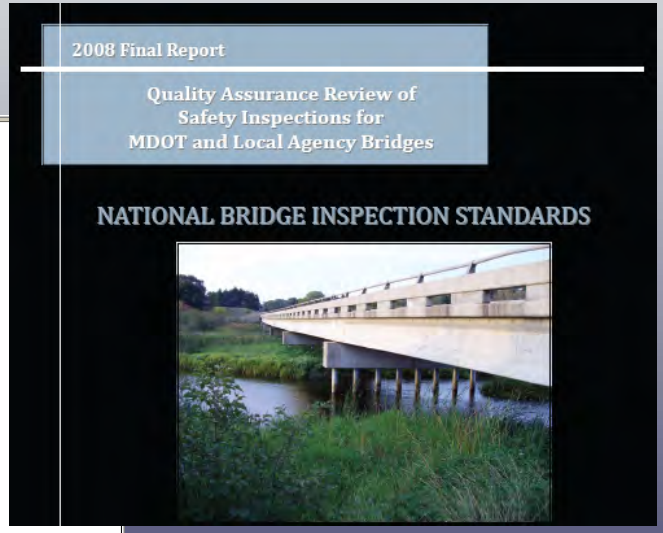


Assessment: ☐QA ☐QC (if QA, continue on page 3)

QUALITY CONTROL RECOMMENDATIONS

List recommendations given to the bridge owner to meet or improve quality control procedures.

- ☐ A separate file should be kept for each structure
- ☐ Use only a Qualified Team Leader (QTL) to perform inspections
- ☐ Keep credentials of inspection personnel on file (inspector, load rater, diver)
- ☐ Perform timeliness reviews to ensure that inspections are completed on time
- ☐ The level of comment detail should increase as condition ratings decrease
- ☐ Inspector should refer to MBIS rating guidelines when recording comments
- ☐ Increase inspection frequency for bridges in poor condition (refer to inspection frequency guidelines for assistance)
- ☐ Load ratings need to be updated (LRFR)
- ☐ Stream cross sections and hydraulic analysis should be completed
- ☐ Perform underwater inspections when applicable
- ☐ Perform fracture critical inspections when applicable



Metric 20: **Inspection procedures – QC/QA**

Improvement Plan (IP_MDOT 2011 M16)

In addition to the approved PCA for Metric 13, Load Rating MDOT will implement the following

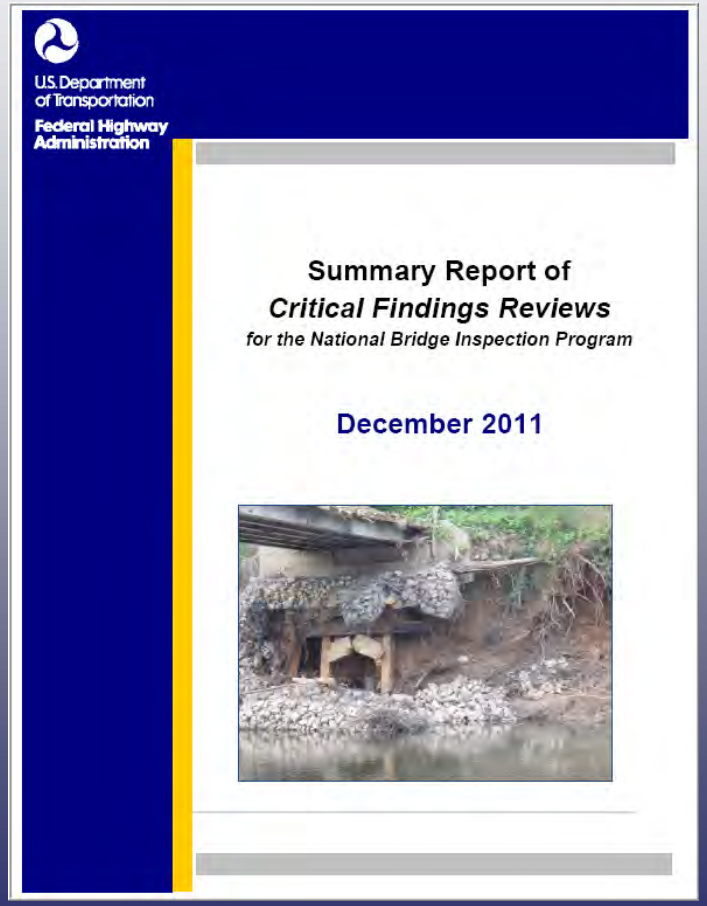
1. MDOT continue to provide a statewide quality assurance program for Local and MDOT owned bridge inspections. (Approx. 60/year)
2. MDOT will develop a Bridge Inspection Manual to describe the minimum procedures for completing Quality Control
3. Through the use of MDOT's Bridge Advisory procedures, MDOT will provide additional guidance to Bridge Owners for maintaining a file which includes quality control procedures. (Same time as Metric 15, Bridge Files)

Metric Performance Reporting

1. MDOT will provide an annual report for MDOT's Quality Assurance Program

Metric 21: **Inspection procedures – Critical Findings**

Has a statewide procedure been established to assure that critical findings are addressed in a timely manner? Is FHWA periodically notified of the actions taken to resolve or monitor critical findings? 650.313 (h)



Critical Finding: "a structural or safety related deficiency that requires immediate follow-up inspection or action."

Summer of 2011, FHWA conducted a focused review of several state's practices for reporting and following up on critical Findings.

After Review of this report FHWA believes practices for addressing critical finding may be improved with enhanced training and more consistent national policies

Metric 21: **Inspection procedures – Critical Findings**

MDOT's Procedures

Bridge Inspection Request for Action

Load Rating, Detailed Inspection, Emergency/ Immediate Repairs

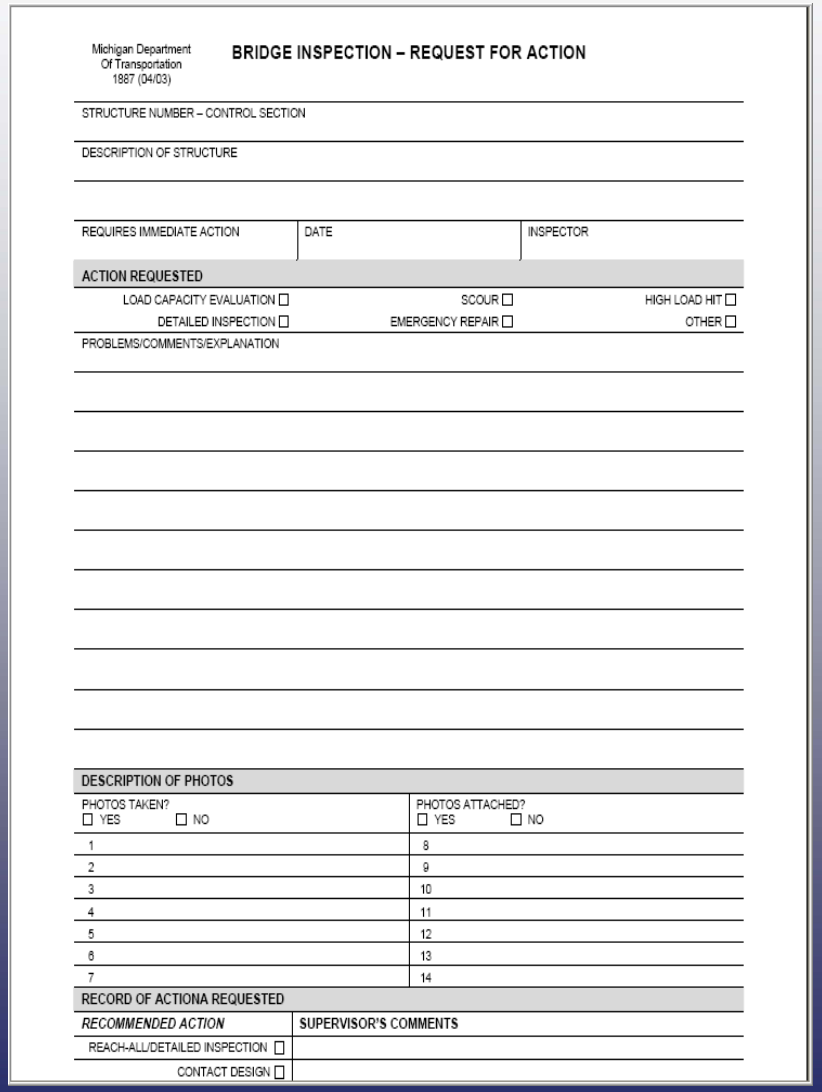
MDOT Tracks status of RFA's (MDOT Owned Structures)

Local Agency Procedures

Have access to Bridge Inspection Request for Action

Some agencies are using RFA, others are using Work Recs provided during Routine Inspection

No Formal Reporting or Tracking Process



Michigan Department Of Transportation 1887 (04/03)

BRIDGE INSPECTION – REQUEST FOR ACTION

STRUCTURE NUMBER – CONTROL SECTION

DESCRIPTION OF STRUCTURE

REQUIRES IMMEDIATE ACTION	DATE	INSPECTOR

ACTION REQUESTED

LOAD CAPACITY EVALUATION ☐ SCOUR ☐ HIGH LOAD HIT ☐

DETAILED INSPECTION ☐ EMERGENCY REPAIR ☐ OTHER ☐

PROBLEMS/COMMENTS/EXPLANATION

DESCRIPTION OF PHOTOS

PHOTOS TAKEN? ☐ YES ☐ NO		PHOTOS ATTACHED? ☐ YES ☐ NO	
1		8	
2		9	
3		10	
4		11	
5		12	
6		13	
7		14	

RECORD OF ACTIONA REQUESTED

RECOMMENDED ACTION	SUPERVISOR'S COMMENTS
REACH-ALL/DETAILED INSPECTION ☐	
CONTACT DESIGN ☐	

Metric 21: **Inspection procedures – Critical Findings**

Metric Review also revealed that FHWA and MDOT does not have formal reporting procedures for critical findings.

Metric 21 Finding: Conditional Compliant

Metric 21: **Inspection procedures – Critical Findings**

Plan of Corrective Action (PCA_MDOT 2011 M21)

1. MDOT will work with FHWA to create an agreement for addressing communication requirements for reporting critical findings to FHWA
2. MDOT will develop a Bridge Inspection Manual to describe the procedures for defining and following-up on Critical Findings
3. Through the use of MDOT's Bridge Advisory procedures, MDOT will provide additional guidance to Bridge Owners for maintaining a file which includes quality control procedures. (Same time as Metric 15, Bridge Files)

Metric 21, Performance Reporting

1. Upon completion of no. 1 above, MDOT will provide reports to FHWA with a summary of Critical Findings and actions taken to resolve these issues.

Metric 21: **Inspection procedures – Critical Findings**

Example

FHWA process for follow-up might include the following components:

A procedure where the State promptly submits to the division office a copy of inspection reports or recommendations contained therein for all on-system and off-system bridges which meet the following criteria:

1. Bridges with recommendations for immediate work on fracture critical members;
2. Bridges with recommendations for immediate correction of scour or hydraulic problems;
3. Bridges with condition ratings of 2 or less for the deck, superstructure or substructure or appraisal ratings of 3 or less for waterway adequacy; and
4. Bridges with recommendations for immediate work to prevent substantial reduction in the safe load capacity

Reference: Formerly Federal-aid Policy Guide Non-Regulatory Supplement NS 23 CFR, Part 650 C, September 30, 1992, Transmittal 5

Metric 22: **Inventory – Prepare and Maintain**

Does the State prepare and maintain an inventory of all bridges subject to the NBIS? 650.315 (a)

Metric reviewed consistency an accuracy of data in database.

- Compared Data in MDOT Database and NBI Database
- Completed Field Visits to verify coding of data. 19 Structures (6 MDOT, 13 Local)

Metric 22 Finding: Compliant

Contact for Coding Errors

Craig Russell, Engineering Technician Specialist
MDOT, C&T Secondary Complex
8885 Ricks Road
Lansing, MI 48854
517-322-1584
e-mail: russellc@michigan.gov

Metric 23: **Inventory – Update Data**

Does the State enter the SI&A data in the inventory within 90 days of the date for State bridges and within 180 days of the date for all other bridges for inspections, bridge modifications and load restriction or closure status? 650.315 (b)(c) & (d)

Metric Review: Randomly selected 19 structures (13 Local, 9 MDOT)

Inspection Date vs. Date Entered into Database

Metric 23 Finding: Compliant

8 Str Num	Date Inspected	Date input into database	No. days	Meets 90 day requirement?	Meets 180 day requirement?
19119022000S020	4/5/2010	4/13/2010	8.00	Y	
23301H00006B030	6/16/2009	7/3/2009	17.00		Y
25307H00003B010	11/23/2010	11/29/2010	6.00		Y
26304H00014B010	5/14/2010	5/18/2010	4.00		Y
27306C00015B010	9/22/2010	10/26/2010	34.00		Y
31312A00010B010	10/15/2009	12/9/2009	55.00		Y
32311H00008B010	8/24/2009	10/19/2009	56.00		Y
39139014000S030	7/13/2010	7/13/2010	0.00	Y	
52152043000B010	5/13/2009	5/28/2009	15.00	Y	
56306H00001B020	8/26/2009	8/28/2009	2.00		Y
634074600038B01	10/26/2010	11/1/2010	6.00		Y
634634800044B01	9/25/2009	10/15/2009	20.00		Y
64164015000S180	4/19/2010	6/29/2010	71.00	Y	
67167015000S050	1/27/2009	1/29/2009	2.00	Y	
67167031000B020	4/28/2009	4/30/2009	2.00	Y	
73316H00017B010	12/29/2009	1/5/2010	7.00		Y
78304H00030B010	12/1/2009	12/3/2009	2.00		Y
79200228000B010	4/1/2009	4/21/2009	20.00		Y
81200038000B010	5/7/2009	5/13/2009	6.00		Y

2012 Bridge Inspection Workshop

THANK YOU!