

## ENGINEERING DIRECTIVE

Carrie Lavallee, P.E. (signature on original)

CHIEF ENGINEER

### MassDOT Critical Finding Procedures to Comply with FHWA NBIS Regulation Requirements

#### 1. Definitions

##### 1.1 Critical Deficiency

Federal NBIS (23 CFR part 650 Subpart C) regulations define a Critical Finding as: *A structural or safety related deficiency that requires immediate action to ensure public safety.*

This definition is consistent with MassDOT's "critical deficiency" and urgency of repair coding, except that MassDOT further subdivides a critical deficiency into two categories:

**Critical Structural Deficiency (C-S):** A deficiency in a structural element of a bridge that poses an extreme unsafe condition due to the failure or imminent failure of the element which will affect the structural integrity of the bridge.

and,

**Critical Hazard Deficiency (C-H):** A deficiency in a component or element of a bridge that poses an extreme hazard or unsafe condition to the public but does not impair the structural integrity of the bridge. Examples include but are not limited to: loose concrete hanging down over traffic or pedestrians, a hole in a sidewalk that may cause injuries to pedestrians, missing section of bridge railing, etc.

Both categories require an Immediate Urgency of Action.

MassDOT considers that Critical Findings can arise from an inspection, a load rating, or a report of damage or other deficiency to a bridge.

When evaluating if a situation meets the definition of a Critical Finding, remember that a full or partial closure of the bridge is always one of the immediate actions to be considered in response.

## **1.2 Addressed**

In these procedures, the word “addressed” refers to the immediate action taken related to the safety issue found. This action can include closure or restriction of the bridge or immediate repair action, such as placing a plate over a hole or removing the loose concrete overhead.

## **1.3 Resolved**

In these procedures, the word “resolved” refers to an action that has been taken and completed to mitigate the safety issue found and protect the public for the long term. This can be making permanent repairs or replacing the bridge.

## **2. Critical Finding Due to Inspection**

### **2.1 Critical Structural (C-S) Deficiency**

Any deficiency in one of the members that form the principal load path from the deck down to the bridge’s foundation which compromises that member’s ability to carry that load as designed is a structural deficiency. To determine if that structural deficiency is a critical finding, the inspector must consider the type of member with the deficiency and the location of the deficiency in that member along with any observed signs that the member is starting to fail, such as excessive deflection or sagging under self-weight, excessive deterioration and corrosion affecting the member’s principal structural characteristics, or undermining of a bearing at a bridge seat, or loss of bearing of the foundation due to scour.

The NBIS states that for inspections, except in the case of Non-redundant Steel Tension Members (NSTM), a Condition Rating coding of 2 (Critical) or worse is considered a Critical Finding. For NSTM members, a Condition Rating coding of 3 (Serious) or worse is considered a Critical Finding. Thus, in the field, inspectors can use the SNBI condition rating descriptions to gage if what they are observing should be considered as critical.

However, in practice, inspectors should first identify the Critical Finding condition and take the action outlined in the procedures below and not wait until the inspection report is complete.

### **2.2 Critical Hazard (C-H) Deficiency**

As noted in its definition, this deficiency designation does not indicate that the structural integrity of the bridge is being compromised but that a deficiency exists that poses a hazard which can result in personal injury or property damage. In addition to the examples cited in the definition, consideration should be given to reinforcing bars or steel armored joint curb that is protruding from the curblin that could potentially catch a tire. It is up to the inspector to assess the danger of the hazard.

### **2.3 Procedure for Identifying a C-S & C-H Deficiency**

When the Inspection Team Leader (TL) determines that a C-S or C-H deficiency exists, they shall immediately notify the District Bridge Inspection Engineer (DBIE) via a video call to discuss the situation and have the DBIE confirm that it meets the criteria of a Critical Finding. The DBIE, after verification, shall immediately verbally notify the District Bridge Engineer (DBE) and the two shall confer on a course of action. This will be relayed to the TL in the field with further guidance, however the TL shall remain onsite for immediate action and documentation. The DBIE shall immediately verbally notify the Area Bridge Inspection Engineer (ABIE) who in return will immediately verbally notify the Bridge Inspection Engineer (BIE), who in return will immediately verbally notify the State Bridge Engineer (SBE) and FHWA MA Division Structures Engineer. The DBE shall separately inform the SBE of the response to the Critical Finding with more detail regarding the intended response action and timeframe for implementation. These steps must all be completed within 24 hours of the verification by the TL and DBIE of the existence of the Critical Finding.

In the case of a municipally-owned bridge, in addition to the steps to be taken in the paragraph above, the DBIE or DBE shall immediately notify the Municipal Officials in Charge of the bridge in accordance with District protocols and shall confer with them on a course of action that they will take. The Municipal Officials in Charge shall also provide a time frame for implementing this action.

If the DBIE is unavailable, the TL shall immediately verbally notify the DBE directly or their designee as outlined by District protocol and follow the same verification procedure as the TL would with the DBIE. In this case, the TL shall also notify the ABIE of the C-S or C-H finding.

Afterwards, when writing the inspection report, the TL shall code all the deficiencies and complete the inspection report and include all sketches and photographs necessary to clearly identify the deficiencies. All reports shall then be given to the DBIE who after review of the report shall forward it to the DBE as part of the Critical Finding documentation. For all Critical Findings, the TL shall indicate in the inspection report the date and time of notification of the DBIE and the actions taken.

In case a C-S or C-H Deficiency is identified during the review process of an inspection report by the DBIE, ABIE, or others, the aforementioned notifications and procedures shall start at the time of identification of the deficiency.

### **2.4 Procedure for Identifying a C-S & C-H Deficiency Due to an Underwater Inspection**

When the Dive Team Leader (DTL) determines that a C-S or C-H deficiency exists, they shall immediately verbally notify both the MassDOT Underwater Operations Engineer (UOE) and the DBIE via a video call to discuss the situation and have the DBIE confirm that it meets the criteria of a Critical Finding. The DBIE, after verification, shall immediately verbally notify

the DBE and the two shall confer on a course of action. This will be relayed to the DTL in the field with further guidance, however the DTL shall remain onsite for immediate action and documentation. The DBIE shall notify the ABIE who in return will immediately notify the BIE, who in return will notify the SBE and FHWA MA Division Structures Engineer. The DBE shall separately inform the SBE of the response to the Critical Finding with more detail regarding the intended response action and timeframe for implementation. All of these steps must be completed within 24 hours of the verification by the DTL and DBIE of the existence of the Critical Finding.

Afterwards, when writing the inspection report, the DTL shall code all the deficiencies and complete the inspection report, including all sketches and photographs necessary to clearly identify the deficiencies. All reports shall then be given to the DBIE who after review of the report shall forward it to the DBE as part of the Critical Finding documentation. For all Critical Findings, the DTL shall indicate in the inspection report the notification of the DBIE and the actions taken.

In the case of a C-S or C-H Deficiency identified during the review process of the inspection report by the DBIE, UOE, or others, the aforementioned notifications and procedures shall start at the time of identification of the deficiency.

## **2.5 Documentation of Action Taken to Resolve C-S & C-H Deficiencies for MassDOT Owned Bridges**

In the case of a C-S or C-H Deficiency on a MassDOT owned bridge, the DBIE, after performing the notifications required in 2.3, shall document with a Safety Review in MassDOT's Work Order Management System for Bridges, Ancillary Structures and Tunnels in accordance with the MassDOT Work Order User Guide. The Safety Review documents the reporting of the Critical Deficiency and must be closed out by documenting the action taken to address the Critical Deficiency. The BIE shall forward the Work Order System Report to FHWA.

## **2.6 Documentation of Action Taken to Resolve C-S & C-H Deficiencies for Municipally Owned Bridges**

In the case of a C-S or C-H Deficiency on a municipally owned bridge, the DBIE, after performing the notifications required in 2.3, shall document with a Safety Review in MassDOT's Work Order Management System for Bridges, Ancillary Structures and Tunnels in accordance with the MassDOT Work Order User Guide. The DBIE shall send a cover letter signed by the District Highway Director (DHD) with supporting documentation to the Municipality and shall document this correspondence in the Work Order Management System Safety Review (refer to the *MassDOT Bridge Inspection Handbook* Attachment 4-14). The cover letter shall require the Municipality to provide the District office with documentation of the action taken. A copy of the completed documentation returned by the Municipality shall be attached to the Safety Review. The BIE shall forward the Work Order System Report to FHWA.

### **3. Critical Finding Due to Bridge LOAD Rating**

#### **3.1 Definition of Bridge Load Rating Based Critical Finding**

The NBIS regulations specify that Critical Findings include situations which warrant: *Immediate load restriction or posting, or immediate repair work to a bridge, including shoring, in order to remain open.* Since Red Cover Load Rating Reports indicate that the calculated load carrying capacity is less than or equal to 6 tons which may require closure of the bridge, rating based Critical Findings shall be primarily limited to those rating reports. All actions taken as a result of a rating report are documented in a “Memo to the NBIS File” which is signed by the SBE.

#### **3.2 Initial Review of a Red Cover Load Rating**

The procedure for processing Red Cover Load Rating Reports is covered in full elsewhere in the *MassDOT Bridge Inspection Handbook*. The relevant steps as they relate to Critical Findings are as follows:

Once a Red Cover Load Rating is received by the MassDOT Bridge Ratings and Overload (BRO) Unit, it is triaged by the SBE and the Bridge Ratings and Overload Engineer (BROE). A Red Cover Load Rating Tracking Form is initiated by the BRO Unit and forwarded to the SBE along with the Red Cover Load Rating Report, the report which is concurrently forwarded to the DHD and DBE. The SBE, or in their absence, their designee, reviews the report and its findings. The SBE then fills out the portion of the form which indicates their initial disposition regarding the findings of the Red Cover Load Rating Report.

If the SBE decides that the Red Cover Load Rating Report and its supporting documentation indicate an unsafe load carrying condition requiring immediate action, this determination shall be written on the Tracking Form and forwarded to the BROE who will then prepare the “Memo to the NBIS File” stating the SBE’s recommended action. This memo will be signed by the SBE and forwarded to the BIE who will initiate standard procedures to implement the memo’s recommendations and will inform FHWA MA Division Structures Engineer within 24 hours of the signing of the Memo to the NBIS File by the SBE. In addition, the BROE shall verbally contact the DBE or their designee and inform them of the SBE’s recommended action.

#### **3.3 Formal Processing of a Red Cover Load Rating**

If the SBE decides that, based on the Red Cover Load Rating Report and its supporting documentation, immediate action is not required, the report shall be forwarded to the BRO Unit for a Quality Assurance review to make sure that there are no errors and that MassDOT agrees with the assumptions and methods of analysis used, the results of the analysis. The SBE will note on the Red Cover Load Rating Tracking Form that the report is being forwarded to the BRO Unit for review and posting or other recommendations.

The BRO Unit shall perform the Quality Assurance review and determine a safe course of action. This course of action may range from closing the bridge to recommending work to keep the bridge open with or without posting, or a combination of actions. The BRO Unit shall prepare the "Memo to the NBIS File" stating the recommended action and the required timeframe for taking the action. This recommended action may consist of a dual recommendation, i.e. a posting or closure recommendation if no work will be undertaken within the required time frame and a posting or other recommendation if specified work is undertaken within a defined period.

This Memo will be signed by the SBE and forwarded to the BIE who will initiate standard procedures to implement the Memo's recommendations and will inform FHWA MA Division Structures Engineer within 24 hours of the signing of the Memo to the NBIS File by the SBE. In addition, the Ratings and Overload Engineer shall contact the DBE or his/her designee and inform them of the rating determination.

### **3.4 Documentation of Action Taken to Resolve Critical Finding Due to Load Rating for MassDOT Owned Bridges**

All posting determinations that include closing or restricting a MassDOT owned bridge, either completely or as one of a dual recommendation, shall be forwarded to the DHD, Attention of the DBE, from the SBE copying the Chief Engineer. Any posting determinations that are only to post the bridge and not close or restrict it shall be forwarded to the DHD, Attention of the DBE, from the SBE.

The memos shall request that the District reply when the posting has been implemented. In the case of a dual recommendation, the memo shall request notification of which course of action will be pursued, the time frame for implementation, and the memo shall also request that the District inform the SBE, BIE and BROE when the work has been completed. The District Bridge Inspection Unit shall perform an "OTHER" inspection to document that the work has been completed and this inspection report will form the basis for a revised Memo to the NBIS File changing the recommendation to reflect the repaired condition.

### **3.5 Documentation of Action Taken to Resolve Critical Finding due to Load Rating for Municipally Owned Bridges**

All posting determinations that include closing or restricting a municipally owned bridge, either completely or as one of a dual recommendation shall be forwarded to the Municipal Officials by letter signed by the SBE copying the MassDOT Chief Engineer. Any posting determinations that are only to post the bridge and not close or restrict it shall be forwarded to the Municipal Officials by letter signed by the MassDOT SBE.

The memos shall request that the municipality reply to the DBE when the posting has been implemented. In the case of a dual recommendation, the memo shall request notification

in writing of which course of action will be pursued, the time frame for implementation, and the memo shall also request that the municipality inform the DBE in writing when the work has been completed. The District Bridge Inspection Unit shall perform an “OTHER” inspection to document that the work has been completed and this inspection report will form the basis for a revised Memo to the NBIS File changing the recommendation to reflect the repaired condition.

#### **4. Critical Finding Due To Other Occurrence**

##### **4.1 Procedure for Reporting a Bridge Damage Critical Finding**

Bridge hits by over height vehicles or other accidents can do structural damage to the bridge’s super and substructure as well as creating a safety hazard to bridge users, such as when a section of bridge railing is demolished. This damage will happen outside the normal inspection frequencies and will most likely be reported by incident response authorities. In serious cases, the DBE will be informed, and the District Bridge Inspection Unit will be called out to inspect the damage and prepare a “Damage” inspection report. If the damage is found to be significant and affects the structural integrity of the bridge, the decision may be to close the bridge or restrict the roadway to isolate the damaged area and bridge members. This damage which results in the closure or restriction of the bridge would trigger a Critical Finding.

When this happens, the DBE shall make sure that the District Bridge Inspection Unit has been informed and vice versa. Once a decision is made to restrict or close the bridge, the DBIE shall notify the ABIE who in return will immediately notify the BIE, who in return will notify the SBE and FHWA MA Division Structures Engineer. The DBE shall separately notify the SBE of the intended response action and timeframe for implementation. All of these steps must be completed within 24 hours of the District’s notification of the damage Critical Finding.

Afterwards, when writing the “DAMAGE” inspection report that follows a determination of a Critical Finding, the Inspection Team Leader (TL) shall code all the deficiencies and complete the inspection report, including all sketches and photographs necessary to clearly identify the deficiencies.

##### **4.2 Other Report from Outside Bridge Inspection**

Bridge deficiencies and other issues may be reported to MassDOT through public safety officials, off duty personnel, the public, and others. When this happens, the DBE or their designee will be informed and verify the finding. If the DBE or their designee determines that the finding is significant and affects either the structural integrity of the bridge or the safety of the public, prompting the closure of the bridge or restriction of the roadway to isolate the damaged area and affected bridge members. This damage would trigger a Critical Finding.

When this happens, the DBE shall make sure that the District Bridge Inspection Unit has been informed and will request that an Inspection Team be called out to inspect the deficiency and prepare an “DAMAGE” inspection report. The DBIE shall notify the ABIE who in return will

immediately notify the BIE, who in return will notify the SBE and FHWA MA Division Structures Engineer. The DBE shall separately notify the SBE of the intended response action and timeframe for implementation. All of these steps must be completed within 24 hours of the District's notification of the Critical Finding.

Afterwards, when writing the damage inspection report, the Inspection Team Leader (TL) shall code all the deficiencies and complete the inspection report and include all sketches and photographs necessary to clearly identify the deficiencies.

## **5. Reporting Critical Findings to FHWA**

In accordance with the NBIS §650.313(q)(2)(i), FHWA needs to be informed within 24 hours of only those critical findings that are on NHS roadways and which require full or partial closure of the bridge or which have an NSTM member that has a condition rating of a 3 or less. This notification must include any actions that were taken, are underway, or that are planned to address and resolve each finding. This shall be done via email to FHWA MA Division Structures Engineer and confirmed by a phone call by the BIE.

The above notwithstanding, NBIS §650.313(q)(2)(ii) requires that FHWA be provided a written monthly, unless otherwise requested, status report on all Critical Findings identified in Sections 2, 3, and 4 of this procedure until resolved. The DBE and the DBIE, together, will notify the BIE of the status of the Critical Findings in their respective District. The BIE will then provide a monthly written status report to FHWA for each critical finding until each is resolved.

For each Critical Finding, this report must contain:

- Owner
- NBI Structure Number
- Date of finding
- Description and photos, if possible, of the Critical Finding
- Description of completed, temporary, and/or planned corrective actions to address the Critical Finding
- Status of corrective actions: Active/Completed
- Estimated date of completion if corrective actions are active
- Date of completion if corrective actions are completed

## **6. Verifying Resolution of Critical Findings**

Upon notification that immediate action and/or planned corrective action has been taken, the District Bridge Inspection Unit shall perform an "OTHER" inspection to document that either the immediate action or the planned corrective action has been completed.



## **7. Critical Findings for Bridges owned by other Massachusetts State Agencies**

### **7.1 Responsibilities of Other Massachusetts State Agencies**

Other Massachusetts state agencies who own highway bridges of NBIS length and who perform their own bridge inspections, load ratings, and maintenance on them, shall be responsible for providing the information required by NBIS to MassDOT, the state transportation agency tasked by the NBIS for causing the proper inspection and evaluation of all NBIS length highway bridges within Massachusetts, when one of their bridges has a critical finding. These Critical Findings shall arise from the following:

1. A full or partial closure of a bridge due to inspection, load rating, or damage.
2. For Non-NSTM members an inspection finding that results in a coding of a Condition Rating coding of 2 (Critical) or worse for:
  - Deck
  - Superstructure
  - Substructure
  - Channel Condition
  - Scour Condition
3. For NSTM members, an inspection finding that results in a coding of a Condition Rating coding of 3 (Serious).
4. An inspection finding that warrants an immediate load restriction or posting, or immediate repair work, including shoring, in order to remain open.

### **7.2 Critical Findings for NHS Bridges Owned by Other Massachusetts State Agencies**

If the bridge is on an NHS roadway and it requires full or partial closure or it has an NSTM member with a condition rating of a 3 or less, the Agency Bridge Inspection Contact shall notify the MassDOT BIE of this critical finding within 24 hours of its determination. This notification must include notification of any actions that were taken, are underway, or that are planned to address and resolve each finding. This shall be done via email and confirmed by a phone call to the BIE. Once received the MassDOT BIE shall notify the FHWA MA Division Structures Engineer via email and confirm by phone call. The BIE shall also notify the MassDOT SBE of the Agency Critical Finding.

### **7.3 Reporting of Critical Findings for Bridges Owned by Other Massachusetts State Agencies**

As required by NBIS §650.313(q)(2)(ii), the other Massachusetts State Agencies shall provide a written monthly, unless otherwise requested, status report on all their Critical Findings as defined in Subsection 7.1 until resolved. The Agency Bridge Inspection Contact shall provide this report to the MassDOT BIE and it shall, at a minimum, include the following information for each Critical Finding:

- Owner
- NBI Structure Number
- Date of finding
- Description and photos, if possible, of the Critical Finding
- Description of completed, temporary, and/or planned corrective actions to address the Critical Finding
- Status of corrective actions: Active/Completed
- Estimated date of completion if corrective actions are active
- Date of completion if corrective actions are completed.

The MassDOT BIE will forward this Massachusetts Agency status report to FHWA.