Summary of Critical Findings Reviews for the National Bridge Inspection Program

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Summary Report of Critical Findings Reviews for the National Bridge Inspection Program

December 2011
Outline

- Background and Objectives
- Introduction
- Findings
  - Typical Critical Findings
  - Common Areas of Good Practice
  - Common Areas of Improvement
- Conclusions
The Federal Highway Administration (FHWA) contracted with HDR to review the current state of highway bridge inspection practice for identifying and following up on critical findings.

- General Services Administration (GSA) Delivery Order: Bridge Safety Technical Support Services for the FHWA Office of Bridge Technology (OBT)
- Base Year (2011) with extensions through March 2013
Background and Objectives

- The requirement for highway bridge owners to address critical findings is established in the National Bridge Inspection Standards (NBIS) (CFR 650.313 (h)):
  - Owners must “assure that critical findings are addressed in a timely manner,” and they must “notify the FHWA of the actions taken to resolve or monitor critical findings.”
  - A critical finding is “a structural or safety related deficiency that requires immediate follow-up inspection or action.”
Background and Objectives

- FHWA believes this study necessary because it is this area of the bridge inspection program that addresses the most serious safety-related conditions on the nation’s bridges.
  - Experience with the national program indicates that state practices for addressing *critical findings* may be improved with more robust and consistent national policies.
  - The information should be useful for federal policy development, but also for inspectors and inspection program managers who want to develop or improve their own procedures.
Introduction

- Summary report of site visits to twelve States
  - Assess processes and procedures for reporting and tracking critical bridge inspection findings (*critical findings*)

<table>
<thead>
<tr>
<th>State</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pennsylvania</td>
<td>June 1-3, 2011</td>
</tr>
<tr>
<td>Texas</td>
<td>June 6-8, 2011</td>
</tr>
<tr>
<td>Virginia</td>
<td>June 13-14, 2011</td>
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<tr>
<td>Rhode Island</td>
<td>June 20-21, 2011</td>
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<td>Massachusetts</td>
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<td>Michigan</td>
<td>June 27-28, 2011</td>
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<td>Ohio</td>
<td>June 30-July 1, 2011</td>
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<tr>
<td>Alabama</td>
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<td>Nebraska</td>
<td>July 25-26, 2011</td>
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<td>Oklahoma</td>
<td>July 28-29, 2011</td>
</tr>
<tr>
<td>Idaho</td>
<td>August 8-9, 2011</td>
</tr>
<tr>
<td>Oregon</td>
<td>August 15-16, 2011</td>
</tr>
</tbody>
</table>
Introduction

- **Independent Review Team:**
  - Visited State offices and bridge sites (selected by the State DOTs)
    - Reviewed bridge inspection information
    - Gained understanding of how the bridge safety program is administered
  - Interviewed FHWA staff, State bridge inspectors and State inspection program managers
    - Investigated aspects of bridge inspection that can lead to **critical findings**
    - Included: fracture critical findings, scour critical deficiencies and plans of action, load rating calculations, critical findings on any primary bridge component, and other safety deficiencies
Introduction

- Developed at the request of the FHWA to help document the current state of the practice
- Incorporates what was discovered on the Critical Findings site visits
- Provides a basis for improved processes for:
  - identifying,
  - monitoring, and
  - correcting critical deficiencies.
Findings

- **Typical Critical Findings**

- **Areas of Good Practice:**
  - Developing and communicating policy, definitions, and descriptions of *critical findings* and categorizing the deficiencies;
  - Monthly schedule/audit reporting and tracking of *critical findings*;
  - Automated *critical findings* notification systems; and
  - Follow-up inspections/posting guidelines to close the loop on *critical findings*.
Typical **Critical Findings**

**Common Areas of Improvement:**

- Lack of a detailed formal definition leaves ambiguity in determining *critical findings*;
- Lack of control for non-State owned bridges (locally-owned or other agency owned bridges) with respect to *critical findings* policy, procedures, tracking and reporting;
- Lack of policy regarding timeline for mitigating or for reporting and verifying corrective actions for *critical findings*; and
- Maintaining barricades and signage on closed or posted bridges.
Common Areas of Good Practice

Finding No. 1 – Critical Finding Policy, Definitions, Descriptions and Categorizing Deficiencies:

- Developed and communicate policy, definitions, descriptions and tracking procedures for critical findings.
- Have a Plan of Action with maximum timeframes for remediation based on assigned priority.
- Categorize the deficiencies and their urgency, assigning priority until permanent repairs are performed.

4/12 or 33% of the States visited developed policy, definitions, descriptions or deficiencies as part of their critical findings process.
Findings

- **Common Areas of Good Practice**
- **Finding No. 1** – Performance Metrics Dashboard 1:

  
  **BOD-NBIS Inspection-Local Bridges**

  This metric calculates each District’s compliance rating for local NBIS bridge inspections greater than or equal to 20 ft. This metric is to ensure that locally owned bridges are inspected in a timely fashion. For the bridges requiring inspection: (Number of actual bridges inspected in the month inspection due / Total Number of Bridges Due for inspection with a specific month) X 100% Local Bridge Owners have 90 days to submit inspection information into BMS2. The report will query inspections due three months prior (e.g. a report run on January 1st will query inspections due in September).
Findings

- **Common Areas of Good Practice**
- **Finding No. 1 – Performance Metrics Dashboard 2:**

```plaintext
BOD-NBIS Inspection-State Bridges

This metric calculates each District's compliance rating for NBIS bridge inspections greater than or equal to 8 ft. This metric is to ensure that bridges are inspected in a timely fashion. For the bridges requiring inspection: (Number of actual bridges inspected in the month inspection due / Total Number of Bridges Due for inspection with a specific month) X 100% Districts have 30 days to submit inspection information into BMS2. The report will query inspections due one month prior (e.g. a report run on January 1st will query inspections due in November).

Actual: 569.00 | Possible: 571.00 | Type: Ratio

History Details Breakdown Trend
```
Findings

- **Common Areas of Good Practice**

- **Finding No. 2** – Monthly Schedule/Audit Reporting and Tracking of **Critical Findings**:
  - Generate reports to inform the FHWA Division of *critical findings*.
  - Bridge Problem Reports, Bridge Schedule Reports, Electronic Bridge Inspection Audit Reports and **Critical Finding Reports**.
  - Reports can be used to log and track *critical findings* from discovery through final resolution.
  
- 7/12 or 58% of the States visited generate reports to track *critical findings*. 
Findings

- **Common Areas of Good Practice**
- **Finding No. 2** – Sortable database of bridges that contains inspection and load rating information, as well as records of critical findings:

<table>
<thead>
<tr>
<th>Period</th>
<th>Calc. Ratio</th>
<th>Actual</th>
<th>Possible</th>
<th>Target</th>
<th>RedPoint</th>
<th>Details</th>
<th>Trend</th>
<th>Breakdown</th>
</tr>
</thead>
<tbody>
<tr>
<td>January 2010</td>
<td>89.74%</td>
<td>35.00</td>
<td>39.00</td>
<td>100.00</td>
<td>95.00</td>
<td>Details</td>
<td>Trend</td>
<td>Breakdown</td>
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<tr>
<td>February 2010</td>
<td>97.96%</td>
<td>48.00</td>
<td>49.00</td>
<td>100.00</td>
<td>95.00</td>
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<td>Trend</td>
<td>Breakdown</td>
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<tr>
<td>March 2010</td>
<td>97.50%</td>
<td>39.00</td>
<td>40.00</td>
<td>100.00</td>
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<td>Breakdown</td>
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<tr>
<td>April 2010</td>
<td>100.00%</td>
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<td>36.00</td>
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<tr>
<td>May 2010</td>
<td>100.00%</td>
<td>41.00</td>
<td>41.00</td>
<td>100.00</td>
<td>95.00</td>
<td>Details</td>
<td>Trend</td>
<td>Breakdown</td>
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<tr>
<td>June 2010</td>
<td>100.00%</td>
<td>20.00</td>
<td>20.00</td>
<td>100.00</td>
<td>95.00</td>
<td>Details</td>
<td>Trend</td>
<td>Breakdown</td>
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<tr>
<td>July 2010</td>
<td>100.00%</td>
<td>29.00</td>
<td>29.00</td>
<td>100.00</td>
<td>95.00</td>
<td>Details</td>
<td>Trend</td>
<td>Breakdown</td>
</tr>
<tr>
<td>August 2010</td>
<td>100.00%</td>
<td>24.00</td>
<td>24.00</td>
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<td>Trend</td>
<td>Breakdown</td>
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<tr>
<td>September 2010</td>
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<td>62.00</td>
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<td>Trend</td>
<td>Breakdown</td>
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<tr>
<td>November 2010</td>
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<td>22.00</td>
<td>100.00</td>
<td>95.00</td>
<td>Details</td>
<td>Trend</td>
<td>Breakdown</td>
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<tr>
<td>December 2010</td>
<td>100.00%</td>
<td>22.00</td>
<td>22.00</td>
<td>100.00</td>
<td>95.00</td>
<td>Details</td>
<td>Trend</td>
<td>Breakdown</td>
</tr>
</tbody>
</table>
Findings

Common Areas of Good Practice

Finding No. 3 – Automated Critical Findings Notification Systems:

- Use automated e-mail to inform the FHWA Division when a critical finding is opened, revised or closed.
- Automatically notify local agencies of due and overdue bridge inspections.
- Program runs monthly and checks all types of inspections (Routine, Fracture Critical, Underwater, etc.).

4/12 or 33% of the States visited have automated critical findings notification systems.
Findings

- **Common Areas of Good Practice**
- **Finding No. 3** – SharePoint Team Site tracks status of all critical recommendations (initiation, work complete, follow-up inspection):
Common Areas of Good Practice

Finding No. 4 – Critical Finding Follow-up Post-Repair Inspections:

- Follow-up inspections are performed after critical findings have been mitigated.
- Provide a record of repair, include photographs of the repaired areas.
- Update the NBI data in accordance with the NBIS, while providing visual documentation of the repair.
- This action definitively closes the loop on the critical finding.

4/12 or 33% of the States visited use critical finding follow-up post-repair inspections.
Findings

- **Common Areas of Good Practice**
- **Finding No. 4** – Deteriorated abutment identified as a *critical finding*: The reinforcing steel is corroded and deformed, and concrete is spilling down the slope wall.

![Image of deteriorated abutment]
Findings

- **Common Areas of Good Practice**
- **Finding No. 4** – Temporary columns support a steel beam under the existing concrete deck, in preparation to replace the abutment that was a *critical finding* in previous Photo.
Findings

- **Common Areas of Good Practice**
- **Finding No. 4** – Photo documentation is used to confirm that the repair was completed and the *critical finding* has been addressed.
Common Areas of Good Practice

Finding No. 5 – Follow-up Load Posting Certifications or Guidelines:

- The load posting certification program ensures that local agencies follow-up on plans to post bridges with required signs at proper locations.
- The load posting guidelines allow bridges to safely remain open until the critical deficiency can be addressed.

2/12 or 16% of the States visited have policies or guidelines for follow-up load posting.
Findings

- **Common Areas of Good Practice**

- **Finding No. 5** – Load posting sign setting the weight limit for various vehicle configurations at 3 tons. One possible outcome from a *critical finding* is to load post the structure.
Common Areas of Improvement

Finding No. 1 – Lack of formal Standards Definition Leaves Ambiguity in Determining Critical Findings. Example Criteria:

- Recommendations for immediate work on fracture critical members;
- Recommendations for immediate correction of scour or hydraulic problems;
- Condition ratings of 3 or less for the superstructure or substructure or appraisal ratings of 3 or less for waterway adequacy; and
- Recommendations for immediate work to prevent substantial reduction in the safe load capacity.

3/12 or 25% of the States visited cited ambiguity in the definition of critical findings.
Common Areas of Improvement

Finding No. 2 – Lack of Control for Non-State Owned Bridges:

- All States reported a lack of control for non-State owned bridges (locally-owned or other agency owned bridges) with respect to policy, procedures, tracking and reporting.
- The DOTs do not have jurisdiction over municipally-owned bridges with critical finding repair or follow-up actions. It is difficult to follow-up or enforce repairs/closures on locally owned bridges.
- 12/12 or 100% of the States visited cited a lack of control for non-State owned bridges.
Common Areas of Improvement

Finding No. 3 – Lack of Policy for Mitigating, Reporting and Verifying Corrective Actions:

- A few States reported a lack of a written policy regarding the timeline for mitigation of deficiencies or a procedure for reporting and verifying corrective actions for critical findings.
- When one State’s Critical Recommendation Form is initiated, the effects of the critical finding can be mitigated (i.e. with a traffic restriction); however, the source of the critical finding may remain unchanged.
- 2/12 or 16% of the States visited cited a lack of policy regarding corrective actions.
Common Areas of Improvement

Finding No. 4 – Maintaining Barricades and Signage on Closed or Posted Bridges:

- A few States reported difficulty maintaining barricades/barriers on closed bridges, and vandalism and removal of bridge load posting signs.
- The most effective technique for closed timber bridge deck bridges is partial or complete deck removal.

2/12 or 16% of the States visited cited challenges maintaining barricades and signs on closed or posted bridges.
Findings

- Common Areas of Improvement
- Finding No. 4 – Barricades in each lane on the bridge approach. Water-filled barriers in the distance, before the bridge, that provide a barrier to any vehicle that might go around the barricades.
Products from twelve State critical findings reviews will improve processes used by bridge owners to take timely corrective measures to:

- avoid bridge closures that may occur due to deficiencies
- prevent bridge failures

Common Areas of Good Practice

Common Areas of Improvement
Conclusions

- Sharing results with bridge owners will:
  - Improve the *critical findings* process.
  - Provide tools to better manage the bridge inspection program.
- Examples of good processes that can be used by State and local agencies interested in establishing or improving the way they address *critical findings*. 
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