Bridge Performance Measures

Midwest Bridge Preservation Partnership Meeting
October 13, 2010
Detroit, Michigan

Anwar S. Ahmad, P.E.
Bridge Preservation Engineer
Federal Highway Administration
Why Performance Measure for Bridges?

- Facilitates improvement of condition and services
- Shows tangible results to our customers and stakeholders
- A tool for strengthening accountability
- A tool to assess the effectiveness of allocated resources
- And so on....
Performance Measure is an Essential Component of Bridge Management
Sharing Practices Between DOTs

- There are several research initiatives that are sponsored by AASHTO Standing Committee on Performance Management

<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>NCHRP 20-24(37)B</td>
<td>Measuring Performance among State DOTs: Sharing Good Practices based on the International Roughness Index</td>
</tr>
<tr>
<td>NCHRP 20-24(37)C</td>
<td>Measuring Performance Among State DOTs, Sharing Best Practices -- Safety</td>
</tr>
<tr>
<td>NCHRP 20-24(37)E</td>
<td>Measuring Performance Among State DOTs, Sharing Best Practices—Preservation: Comparative Analysis of Bridge Conditions</td>
</tr>
<tr>
<td>NCHRP 20-24(37)F</td>
<td>Establishment of Comparative Performance Measures Program Infrastructure to Support National System Performance Data Collection and Analysis</td>
</tr>
<tr>
<td>NCHRP 20-24(37)H</td>
<td>Workshop on Transportation-System Performance Measures Suitable for National Use</td>
</tr>
</tbody>
</table>
NCHRP 20-24 (37)E Comparative Performance Measurement for Bridge Condition

- Report is based on NBI data for 34 States
- Report identifies 8 Bridge Condition Performance Measures
  2. Bridges with Sufficiency Rating (SR) ≤50 – Deck Area (2009)
  4. Bridges in Good Condition (NBI GCR ≥7) - Deck Area (2009)
  5. Structurally Deficient Bridges – Deck Area (Change from 1999 - 2009)
  7. Posted Bridges - Deck Area (Change from 1999 - 2009)
  8. Bridges in Good Condition - Deck Area (Change from 1999 - 2009)
## NCHRP 20-24 (37)E Comparative Performance Measurement for Bridge Condition

<table>
<thead>
<tr>
<th>Performance Measure</th>
<th>Results Summary Across Participating States</th>
<th>1999 NBI Data</th>
<th>Change in Data from 1999-2009</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Range</td>
<td>Mean</td>
</tr>
<tr>
<td>SD Bridges</td>
<td></td>
<td>1% to 20 %</td>
<td>7%</td>
</tr>
<tr>
<td>Low Sufficiency Rating</td>
<td></td>
<td>0% to 17%</td>
<td>4%</td>
</tr>
<tr>
<td>Posted Bridges</td>
<td></td>
<td>0% to 18%</td>
<td>2%</td>
</tr>
<tr>
<td>Bridges in Good Condition</td>
<td></td>
<td>3% to 83%</td>
<td>40%</td>
</tr>
</tbody>
</table>

**Change in Data from 1999-2009**

- SD Bridges: -15% to +9% (22 States improved or stayed the same)
- Low Sufficiency Rating: -12% to +4% (27 States improved or stayed the same)
- Posted Bridges: -5% to +4% (27 States improved or stayed the same)
- Bridges in Good Condition: -42% to +21% (14 States improved or stayed the same)
Commendable Practices

Criteria:

- One State from each of the four regions (NE, S, MW, W)
- States that are showing improvement in 2009 as well as improvements between 1999 – 2009
- Used SD, SR, and Bridges in Good Condition measures

Based on the aforementioned criteria the following states were selected:

- Kansas
- Utah
- New York
- Georgia
Contributing Factors to Strong Performance

1. Make the Case for Bridge Investment
   A. Establish and use Performance Measures for benchmarking bridge condition and communicating agency targets
   B. Determine funding requirements to meet performance targets
   C. Document agency approach to prioritizing rehab and replacement work to ensure funds are targeted to the appropriate projects and to improve accountability

2. Emphasizing Bridge Preservation
   D. Inspect bridges at the element level
   E. Track bridge-level work recommendations as part of bridge inspections, and establish an approach to tracking and prioritizing bridge work recommendations
   F. Establish programs for common types of preservation actions such as bridge washing, joint repairs, deck overlays, painting and concrete repairs
Contributing Factors to Strong Performance (Cont’d)

3. Construct Maintainable Bridges

G. Discourage the use of high maintenance design details, i.e. eliminating expansion joints when possible

H. Encourage the use of standard designs – institutionalizing maintainable bridge designs to reduce the high maintenance details and reduce the time and cost for engineering

I. Take advantage of alternative contracting and delivery approaches such design/build and accelerated bridge construction

J. Enhance communications between bridge design and maintenance staff through quarterly or annual meetings
Recommendations for future Comparative Performance Measurement for Bridge Condition:

1. Continue use of performance measures based on NBI data for the short-term.
2. Support Transition to use element level data
3. Base bridge performance measure on Deck Area
4. Use good, fair, poor categories
5. Include SD bridges as a supplement measure
6. Track bridge condition measure independent of bridge decks
7. Track changes in bridge condition in addition to current condition
8. Don’t use posted bridges as a primary measure
9. Support bridge inspectors training and QA
10. Improve bridge cost data
Bridge Preservation Thoughts

Bridge Management Program Approach

• Three Components Approach
  – Preservation
  – Rehabilitation
  – Replacement
Bridge Preservation Thoughts

Essential components of a good bridge preservation program:

• Funding – establish dedicated funding mechanism separate from rehab, replacements, and capital improvements funds

• Program Parameters - identify strategies and qualifying activities
  – Consider an approach that focuses on bridges that are in fair to good condition
  – Consider an approach that focuses on cyclical activities, i.e. cleaning bridges, lubricating bearing, tightening fasteners, sealing decks, zone painting steel girders, etc.
  – Consider an approach that is condition driven, i.e. painting steel elements, installing deck overlays, replacing leaking deck joints, installing cathodic protection/prevention systems, etc
Bridge Preservation Thoughts

- Establish Bridge Preservation related performance measures

Performance measure examples:
  - Maintaining X% of bridges in good condition
  - Maintaining X% of expansion joints in good and not leaking condition
  - Maintaining X% of coated steel surfaces in good condition
  - Maintaining X% of bearing devises in good condition
  - Clean 100% of all bridges that are in good condition annually
  - Consider establishing different Performance Targets for different highway systems, or different functional classification, or certain ADT ranges
Bridge Preservation Thoughts

- Perform bridge preservation needs assessments based on the established program parameters noted previously
- Establish performance measure benchmark, monitor the overall performance of the program regularly, and make adjustments as needed

- Similar steps can be considered in establishing dedicated rehabilitation and replacement programs
Thank you!

Anwar S. Ahmad, P.E.
Bridge Preservation Engineer
Federal Highway Administration
Telephone: (202) 366-8501
Email: Anwar.Ahmad@dot.gov