Developing an Effective Bridge Preservation Program

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BRIDGE PRESERVATION

Bridge Preservation
- Preventive Maintenance
- Rehabilitation

Bridge Replacement

Cyclical (Non-Condition Based) Activities

Condition Based Activities
Preserve it or sign it?
Bridge Preservation Requires

- Design for the long term
- Design with inspection, maintenance, and preservation in mind.
- Constructing the bridge as designed
- Cyclic and corrective maintenance treatments completed in a timely fashion.
- Inventory and cost data, and a computer program to handle the data.
- Continuous promotion to obtain and maintain the needed funding
DESIGN FOR THE LONG TERM

- Construct bridges of easy to maintain and long lasting materials.
- Select design details that are easy to maintain.
- Locate piers out of the water, or design for the maximum scour depth.
- Design for the regional climate and winter maintenance practices.
- For bridges in cities, design for the urban environment.
- Provide additional vertical clearance.
A bridge and a condo
Bridge Troll?
Bridge surfaces in Urban areas will end up like this.
Treat concrete with waterproofing agents

No protection for concrete
Linseed oil protected concrete
Chloride levels decreased with a washing cycle of once per day, but no change was observed with washing cycles of once per week or once per month.
Preventive Maintenance Development Process

- Select preventive maintenance treatments
- Develop and test treatments
- Select treatments that provide the best return for the cost considering climate, winter maintenance, ADT, etc.
- Prioritize
- Deliver the Preventive Maintenance program
- Review Results
- Make changes to improve the program
What is Measured Gets Funded (WSDOT)

- Percent of Bridges in Good and Fair Condition
- Number and Deck area of S/D and F/O Bridges
- Percent of Priority 1 Repairs completed within a year
- Deck Condition
- Percent of truss bridges cleaned.
Funding Increased for Maintenance

Due to Low Structural Repair Scores funding in 2009 - 2011 biennium was increased $1.5 Million for structural bridge repairs. This was to increase scores from an F to a C.

For the 2011 to 2013 biennium funding was increased for Deck repairs by $530,000 to increase the deck score.

For 2013-2014 $2 million set aside for bridge cleaning. (108 bridges)
Data

Maintenance Work Operation Codes are needed to collect enough information to determine:

- What was done
- When it was done
- What was the cost
- Which Bridge and what element was repaired or preventive maintenance treatment applied.
Select a program that meets your needs
- Can it handle the data?
- Is it easy to enter information?
- Is it easy to retrieve data?
- Can you use the information to show the current condition of a bridge, the cost to maintain, and the backlog of needed work.
- Can you show the trend of your overall bridge preservation program?
## Bridge Asset Management Backlog

<table>
<thead>
<tr>
<th>Asset activity</th>
<th>Preservation Biennial Funding</th>
<th>Preservation Backlog</th>
<th>Maintenance Biennial Funding</th>
<th>Backlog Units</th>
<th>Maintenance Backlog</th>
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<tbody>
<tr>
<td>Structural Repair</td>
<td>$15,000,000</td>
<td>$75,000,000</td>
<td>$1,200,000</td>
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<td>Expansion Joints</td>
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<td>Scour</td>
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<td>$346,000,000</td>
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<tr>
<td>Painting</td>
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<tr>
<td>Bridge Cleaning</td>
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<td>$75,000,000</td>
<td>$2,124,011</td>
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<td>Decks</td>
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<td>2306</td>
<td>$23,163,622</td>
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</tbody>
</table>

Total Preservation Biennial Funding: $111,000,000
Total Preservation Backlog: $531,000,000
Total Maintenance Biennial Funding: $27,403,982
Total Maintenance Backlog: $23,163,622
Maintenance Pilot Project

- Bridge washing - *Graduated to a statewide funded program*
- Bridge maintenance inspections
- Joint sealing
- Spot and area painting with one coat paint and an SP3 preparation
- Stopping fatigue cracks with cold expansion
- Use of borate rods and paste on timber members at first sign of decay.
Bridge Washing

- **2010** – 7 bridges, cost: $98,289 = $14,041/bridge
- **2011** – 8.5 bridges, cost $91,219 = $10,731/bridge
- **2012** – 12 bridges, cost: $87,350 = $7,279/bridge
- **2013** – 16 bridges, cost $93,600 = $5,850
- 51% reduction in cost per bridge
Skagit River Bridge
Floor beam 6 after cleaning
Bridge washing comparison

Sol Duc River Bridge Before

Sol Duc after Cleaning
Bridge Washing Pilot

• The science has shown that there is little change in water quality if you flush a bridge annually.
• The Department of Ecology now Permits annual flushing of bridges over fresh water without first hand cleaning.
New Bridge Maintenance Activities Added

- Bridge spot and area painting program
- Testing out a single coat paint (Calcium Sulfonate) for use with an SP3 preparation
- Use of borate rods to halt decay in timber members.
- A better way to stop fatigue cracks (How the airlines prevent cracks on their airplanes.)
Guide for In-Place Treatment of Wood in Historic Covered and Modern Bridges

Stan Lubow
Grant Kerker
Robert White
Lacy Amburgoy
H. Michael Barnes
Michael Sanders
Jeff Remell
Cold Expansion to Stop Fatigue Cracks & Spot Painting Programs

Spot Painting

Cold Expansion

[Images of bridge components showing cold expansion and spot painting]
Bridge Preventive Maintenance Program Results

• Priority 1 Repairs dropped from about 85 per year to just 27 for the Olympic Region.
• Enabled crews to do preventive maintenance work that will reduce future repairs.
• Allowed crew to do repairs that removed weight limits from 3 bridges and raised the vertical clearance on another.
Maintenance System Improvements

Removed weight limits

Raised Portals
Preservation Cycle

Bridge Condition Diagram

Cyclic Maintenance Needs (CM) NBI 7 - 9
- a: Unchanged

Preventative Maintenance Needs (PM) NBI 5 - 6
- b: Unchanged

Replacement or Major Rehabilitation Needs (RR) NBI 0 - 4
- c: Unchanged

General Targets:
\[ v \geq y \quad u \geq x \]
\[ u + v + w \geq x + y + z \]
IDEAL TREND

2004 - 2011 Bridge Condition
All Roadway Bridges

% OF BRIDGES

0% 10% 20% 30% 40% 50% 60% 70%

Routine or Cyclic PM  Condition Based PM or Minor Rehab  Replacement or Major Rehab

2004 2005 2006 2007 2008 2009 2010 2011

2004 2005 2006 2007 2008 2009 2010 2011

2004 2005 2006 2007 2008 2009 2010 2011

NATIONAL BRIDGE PRESERVATION PARTNERSHIP CONFERENCE 2014
QUESTIONS?