ACEC Partnering Conference 2012

Truss Bridges of Kentucky

1899
Amanda Abner
Rebecca Turner

1893
Truss Bridges of Kentucky
Truss Bridges of Kentucky

Vincennes Bridge Company

Champion Bridge Company

Empire Bridge Company
Truss Bridges of Kentucky

Henry Lawrence Bridge
1934

Kennedy Bridge,
1964
Truss Bridges of Kentucky

Some types are very rare

- Whipple-Murphy- 3
- Parker Pony- 1
- Bedstead- 2
- Baltimore Through- 3
- Baltimore Deck- 1
- Bowstring- 2
- Pennsylvania Petit- 3
- Pratt Deck- 2

Circa 1890s Whipple Truss, Breathitt County
Truss Bridges of Kentucky

Garrett Bridge
Floyd County
Methodology

The most important historic truss bridges in each District were identified based on:

- Truss Type/Rarity
- Best Examples of Type
- Association with Historic Bridge Companies
- Historic Setting/Historic District
- Integrity of Historic Elements (e.g., stone abutments, decorative features)
- Association with Other Historic Events (e.g., railroad, WPA)
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Interviews with District Bridge Engineers

Ted Grossardt
Len O’Connell
Kentucky
Transportation Center
Objective of Interviews

- Identify major repairs/work needed to maintain bridge for 20 years
- Generate *rough estimate* of cost to preserve
- Obtain estimate of amount of effort to preserve the bridge on a scale of 1 (very little or no effort) to 10 (most difficult)
- Opinion regarding preservation or replacement
- Identification of functional issues related to the preservation effort (e.g., problems with approach, traffic issues)
# Attributes of Bridges in Tables

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bridge Identification Number</td>
<td>A bridge with a B is state maintained; One with a C is county Maintained</td>
</tr>
<tr>
<td>Sufficiency Rating</td>
<td>From the NBI, ranging from 0.0 (closed) to 100 (condition new)</td>
</tr>
<tr>
<td>Year Built</td>
<td>Year said to be built; but may be year rehabilitated and not always accurate</td>
</tr>
</tbody>
</table>
## Attributes of Bridges in Tables

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work Effort to Preserve</td>
<td>Ranges from very little or no effort (1) to most difficult (10)</td>
</tr>
<tr>
<td>Replace or Preserve</td>
<td>Engineer’s opinion on bridge’s preservation Potential</td>
</tr>
<tr>
<td>Historic Qualities</td>
<td>Lists some of the qualities that render the bridge of historic interest</td>
</tr>
<tr>
<td>Preserve but bridge presents significant functional issues (summary table only)</td>
<td>The bridge engineer said it could be preserved but mentioned significant obstacles that might stand in the way of preservation, such as traffic flow issues or cost greater than replacement</td>
</tr>
<tr>
<td>Cost to Preserve</td>
<td>This is a very rough estimate of the cost of preservation</td>
</tr>
</tbody>
</table>
## District 3 Summary

<table>
<thead>
<tr>
<th>ID</th>
<th>S.R.</th>
<th>Year Built</th>
<th>Work Effort</th>
<th>Replace or Preserve</th>
<th>Cost to Preserve</th>
<th>Historic Qualities</th>
</tr>
</thead>
<tbody>
<tr>
<td>071C23</td>
<td>25.0</td>
<td>1925</td>
<td>3.5</td>
<td>Preserve</td>
<td>$600,000 with painting, $80,000 without</td>
<td>Stone abutments, pin connections</td>
</tr>
<tr>
<td>085C05</td>
<td>25.0</td>
<td>1911</td>
<td>2.5</td>
<td>Preserve</td>
<td>$100,000</td>
<td>Camelback, Pin Connections</td>
</tr>
<tr>
<td>114C07</td>
<td>16.5</td>
<td>1911</td>
<td>5.5</td>
<td>Preserve</td>
<td>$500,000 to $800,000</td>
<td>Pratt Half-hip Pony, Pin Connections, Stone abutments</td>
</tr>
<tr>
<td>085C07</td>
<td>24.7</td>
<td>1921</td>
<td>9</td>
<td>Replace</td>
<td></td>
<td>Vincennes Bridge Co.</td>
</tr>
</tbody>
</table>
## Results by Sufficiency Rating Category

<table>
<thead>
<tr>
<th>Sufficiency Rating Category</th>
<th>Number of Bridges</th>
<th>Opinion Preserve</th>
<th>Opinion Replace</th>
<th>Preserve w/ Functional Issues</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0-9.99</td>
<td>6</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>10-19.99</td>
<td>14</td>
<td>3</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>20-29.99</td>
<td>16</td>
<td>9</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>30—39.99</td>
<td>7</td>
<td>2</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>40-49.99</td>
<td>16</td>
<td>16</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>50-59.99</td>
<td>7</td>
<td>6</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>60-69.99</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>70-79.99</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>80-89.99</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>90-100</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td><strong>72 (100%)</strong></td>
<td><strong>43 (59.7%)</strong></td>
<td><strong>13 (18.1%)</strong></td>
<td><strong>16 (22.2%)</strong></td>
</tr>
</tbody>
</table>
Observations from the Districts

- Many of the truss bridges can be maintained/preserved
- Maintenance needs (esp. painting) are underfunded, aggravating deterioration rates
- A spot painting program and/or the use of marine grease may be needed
- More frequent joint repair/replacement to lengthen life of bridge
Barriers to Preservation

- Functional Issues – Width, Approaches, Existing and Future Traffic Mix, Heavy Agricultural or Industrial use – some bridges simply don’t meet the functional needs of the routes they serve.
- County Maintained Bridges – County has little incentive to maintain. State will fix or replace if it gets too bad.
- Understanding Federal Funding.
Federal Bridge Preservation Program

- Federal Funding **can** be used to rehabilitate these bridges – even if they show up on the Highway Plan as “replace”.
- A bridge is eligible for rehabilitation if it has a sufficiency rating below 80. It **is not required** to reach a post-rehabilitation SR of 80 to qualify for federal funding.
- The bridge must not have been federally funded for construction or restoration within the last ten years.
Federal Bridge Preservation Program

- The bridge must be rehabilitated “to maintain or upgrade its structural capacity to the present and anticipated future capacity needed for route traffic.”
- The State Agency makes this determination.
- Kentucky: County Roads = 18 Tons
  State Routes = 22 Tons
  AAA Highway = 31 Tons
- If these targets cannot be met, the bridge may still remain in the system with a posted weight limit.
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Historic Rockcastle River Bridge

Tom Matthews & Phil Logsdon
Rockcastle River Bridge

- KY 490 Rockcastle and Laurel Counties
- Rural – Low Volume Road (200 ADT)
- Pennsylvania Petit Steel Truss
  - Constructed in 1921
  - 205’ long, 18-20’ wide
  - Sufficiency Rating = 38.7
Other Project Issues

- Only three Pennsylvania Petit Steel Truss bridges remain in Kentucky
- Outstanding Resource Water
- Endangered Mussels
- Sheltowee Trace National Recreation Trail
- 22-Mile detour
- 2006 Estimated replacement costs >$1.8M
2006 Design

Remove Horizontal Deficiencies

Existing Bridge

Rockcastle River
Issues Associated With Bridge

- 3-Ton Weight Limit
- Overall Condition - Paint
- Vertical Member Repairs
- Gusset Plate Repairs
- End Post Plate Replacement
Alternative Costs

Replacement
Estimate = $1.8M
(ROW + Utilities + Construction)

Paint and Repair
Engineer’s Estimate = $913K
Four Bids = $465K - $696K
Low Bid = $465K
Rockcastle River Bridge

- Plans Developed In-House
- Let - September 28, 2011
- $465K - Spartan Contractors
- Closed - October 17-21
- Completed - December 5, 2011
Existing Joints needed replacement 1~reseal, and 1~slide plate to 4” strip seal
Vertical member repairs - Section loss was the factor for the 3 ton weight posting.
Lateral Gusset Plate repairs - Several with excessive deterioration
End Post Plate repair - All 4 locations
Plan ~ vertical member repair
Plan ~ lateral gusset plate repair

Notes:
1. The Contractor is responsible for field verifying all dimensions.
2. Cost of labor, tools, equipment and materials to complete the repair are detail on this sheet shall be included in the unit price bid for each noted repair.
3. See Bridge Repair Sheet B1 for high strength bolted connection.

Furnish Shims or Filler Plates as needed between Gusset Plate and Lateral Brace. Support existing Lateral Brace as needed.
Joint Reseal, Joint Replacement
Construction
Vertical Member Repair
Construction
Vertical Member Repair
Construction
Lateral Gusset Plate Repair
Construction
Lateral Gusset Plate Repair
Construction:
End Post Plate Repair.....Note new plate installed after painting
Cleaning, Painting
Cleaning, Painting
Containment Down finished product.....Note masonry coating on deck curb.
Finish ~ Vertical Member Repair
Finish ~ Lateral Gusset Plate Repair
Finish ~ End Post Repair
Completed Bridge

- 20+ year repair
- 15-Ton weight limit
- 5-Day Closure

- 2-months with 1-lane
- 75% Savings
Lessons Learned/Conclusions

- Very few historic truss bridges remain
- We need to get better at estimating rehabilitation costs
- Rehabilitation should be considered – even for bridges identified for “replacement” in the highway plan
- “Right Sizing” a project may save overall project costs, including environmental costs
- District Bridge Engineers are interested in preserving and maintaining historic truss bridges
- Consider investing more in preventive maintenance