Load Testing For Load Rating: Route 10 Over Unknown Creek Hobart, NY

Jonathan Kunin, NYSDOT

Harry White, NYSDOT
Route 10 over Unknown Creek

- Reinforced concrete slab bridge
- Built in the early 50’s
- North of the Town of Hobart
- NYSDOT Region 9
Route 10 over Unknown Creek

- 15 Degree skew
- 20 Foot clear span
- 43 Feet wide carrying 2 lanes of traffic
- 16.25 in. thick slab
- Asphalt overlay
4 Feet + (0.06 x Span Length)

Distribution width = 5.29 Feet

Load rated using a 1 foot wide strip
### Current Load Rating

<table>
<thead>
<tr>
<th>Live Load</th>
<th>Rating Factor</th>
<th>Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>H20-44 (Inventory)</td>
<td>0.807</td>
<td>16.14 tons</td>
</tr>
<tr>
<td>H20-44 (Operating)</td>
<td>1.348</td>
<td><strong>26.26 tons</strong></td>
</tr>
<tr>
<td>HS20-44 (Inventory)</td>
<td>0.807</td>
<td>29.06 tons</td>
</tr>
<tr>
<td>HS20-44 (Operating)</td>
<td>1.348</td>
<td>48.53 tons</td>
</tr>
</tbody>
</table>
Northern Approach
Elevation
Framing
Damaged Area
Ways to Raise a Load Rating

- Evaluate in-situ member strength
  Are properties better than assumed?

- Evaluate load distribution
  What are the load paths?
  What levels of load does a member actually see?

- Evaluate support conditions
  Is there fixity reducing midspan moments?
Instrumentation Plan

36 & 37 on rebar (foil)
BDI Strain Gage
Foil Strain Gage
Foil Gages on Rebar
Instrumentation
Gage Cables
Monitoring Vehicle
## Test Vehicles

- **2 Test vehicles**
- **Weighed and measured**

<table>
<thead>
<tr>
<th></th>
<th>Front Axle</th>
<th>Rear Axle</th>
<th>Gross Wt.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Truck A</td>
<td>13.5 kips</td>
<td>29.4 kips</td>
<td>42.9 kips</td>
</tr>
<tr>
<td>Truck B</td>
<td>12.9 kips</td>
<td>27.9 kips</td>
<td>40.8 kips</td>
</tr>
</tbody>
</table>
Semi Static Testing

- Start with Truck A driving up center of the bridge at a crawl speed
- Readings were low
- Load appeared well distributed
- Compression readings at the abutments
  - Indicates some level of end restraint
Impact Testing

- Truck A travels Northbound
- Crosses bridge at 5, 15, 30, 45 and 55 mph
- Data collected at 1000 samples / second
- Signal noise in data
- Readings still in range with initial crossing
Impact Test – Foil Gages

![Graph showing microstrain over time for different impact speeds](image)

- 5 mph
- 30 mph
- 45 mph
- 55 mph

**Axes:**
- **Y-axis:** Microstrain
- **X-axis:** Time (seconds)
Incremental Loading

Truck A

Truck B

Truck A

Truck B

Truck A
Incremental Loading
Incremental Loading
Strain Contour Plot
Strain Contour Plot
Finite Element Model
Finite Element Model – Truck A
Finite Element Model – Trucks A&B
Strain Contour Plot
σ = Eε

Peak concrete strains ≈15 με

Peak FEM Stress ≈75 psi

E = 5,000,000 psi

Using ACI’s E = 57,000 x (f’c)½

f’c ≈ 7,500 psi
Finite Element Model – One Wheel
Finite Element Model – One Wheel
Strain Contour Plot
What’s a Posting???
Load Rating

- Small increase to distribution width removes R-Posting
- Testing and FEM model agree distribution width is more than 7 feet
- Ignore strength increase
- Ignore fixity at abutments
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<td>H20-44 (Inventory)</td>
<td>1.022</td>
<td>20.44 tons</td>
</tr>
<tr>
<td>H20-44 (Operating)</td>
<td>1.704</td>
<td>34.07 tons</td>
</tr>
<tr>
<td>HS20-44 (Inventory)</td>
<td>1.022</td>
<td>36.80 tons</td>
</tr>
<tr>
<td>HS20-44 (Operating)</td>
<td>1.704</td>
<td>61.33 tons</td>
</tr>
</tbody>
</table>
Past Testing – Sprout Creek Posting Removed
Past Testing – Swamp River
Not Posted
Past Testing – Dean’s Mill
Posting Raised From 12 To 20 Tons
Past Testing – Plattekill Creek
Remained R-Posted
What Makes a Good Test Candidate?

- 4 for 5 is a misleading statistic
- Posting is a problem
  - Economic hardship
  - No other convenient trucking route
- Bridge is in good condition
- I know this bridge is OK, how can I prove it?
Potential Load Test Candidate
No Longer A Load Test Candidate
Need Testing?

- Currently training new staff
- Available for future testing
- We’ll do our best to help
Contact Information

Jonathan Kunin and Harry White

Transportation Research & Development Bureau
New York State Department of Transportation

50 Wolf Road   POD 3-4

Albany, NY  12232

Phone: (518) 457-3885
FAX: (518) 475-7535

jkunin@dot.state.ny    hwhite@dot.state.ny