CROWN POINT BRIDGE
Old & New

Richard Marchione, PE
NYSDOT, Office of Structures

Northeast States Materials Engineers Association (NESMEA) Annual Meeting
October 5, 2010
Pier 8
Problem: Pier Deterioration

Observations at Pier 5:

- 2009 Visual: 12"
- 2009 Tested: 18"
- Depth of Erosion/Scaling (inches)

Graph showing depth over years:
- 1995: 2"
- 2000: 3"
- 2005: 5"
- 2009: 20"

Inlet diagram and image of erosion.
Basis for Bridge Closure

- Weakened structural system
- Recent pier deterioration rapid & significant
- Abrupt failure of unreinforced concrete possible
- Frozen bearings inflexible in cold temperatures
- Freeze/thaw increases damage & risk
- Unacceptable risk to the public
Demolition
Design/Construction Schedule

- October 16, 2009: Bridge Closed
- December 28, 2009: Bridge Demolished
- February 5, 2010: FHWA granted Design Approval
- March 17, 2010: Project Advertised
- April 15, 2010: Project Letting
- May 27, 2010: Project Awarded Flatiron Construction Corp.
- December 31, 2011: Project Completion Date
Public Input

Summary

- Survey
  - Bridge Features
  - Bridge Concepts

Public Information Session Survey Form

1. Bridge features and design criteria
   Please check all that apply:
   - Length of bridge
   - Usability
   - Maintenance cost
   - Esthetics
   - Safety

2. Bridge Concepts
   Please rate the following bridge concepts for the Lake Champlain area:
   - Favorable
   - Neutral
   - Unfavorable

[Survey Form Options]

[Bridge Concepts Images]
Alternates

Segmental Concrete Bridge

Steel Composite Cable-Stayed Bridge

Long-Span Steel Girder Bridge

Concrete Extradosed Bridge
Network Tied Arch
Old and New
# Bridge Statistics

<table>
<thead>
<tr>
<th></th>
<th>Old</th>
<th>New</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Year Built</strong></td>
<td>1928-29</td>
<td>2010-11</td>
</tr>
<tr>
<td><strong>Length</strong></td>
<td>2187’</td>
<td>2200’</td>
</tr>
<tr>
<td><strong>Maximum Span</strong></td>
<td>434’</td>
<td>480’</td>
</tr>
<tr>
<td><strong>Number Spans</strong></td>
<td>14</td>
<td>8</td>
</tr>
<tr>
<td><strong>Cost</strong></td>
<td>$1,149,032.63</td>
<td>$69,613,967.60</td>
</tr>
</tbody>
</table>
# Design

<table>
<thead>
<tr>
<th></th>
<th>Old</th>
<th>New</th>
</tr>
</thead>
<tbody>
<tr>
<td>AASHTO</td>
<td>Working Stress</td>
<td>LRFD</td>
</tr>
<tr>
<td>Design Live Load</td>
<td>H15 [15 tons]</td>
<td>HL 93 [36 tons + lane load]</td>
</tr>
<tr>
<td>Roadway Width</td>
<td>24’</td>
<td>32’</td>
</tr>
<tr>
<td>Vertical Clearance</td>
<td>95’ / 14’</td>
<td>75’ / 16’ -6”</td>
</tr>
<tr>
<td>Sidewalks</td>
<td>none</td>
<td>2 @ 5’</td>
</tr>
</tbody>
</table>
## Materials

<table>
<thead>
<tr>
<th></th>
<th>Old</th>
<th>New</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structural Steel</td>
<td>A7, $F_y = 32$ ksi</td>
<td>A709, $F_y = 50$ ksi, 70 ksi</td>
</tr>
<tr>
<td>Concrete</td>
<td>3,000 psi</td>
<td>3,000 psi</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5,000 psi [shafts]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5,000 psi [p/c deck]</td>
</tr>
<tr>
<td>Reinforcing Steel</td>
<td>$F_y = 32$ ksi</td>
<td>$F_y = 60$ ksi</td>
</tr>
</tbody>
</table>
## Materials

<table>
<thead>
<tr>
<th></th>
<th>Old</th>
<th>New</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connections</td>
<td>Rivets</td>
<td>Bolts, Welds</td>
</tr>
<tr>
<td>Bearings</td>
<td>Roller</td>
<td>Disc</td>
</tr>
<tr>
<td>Protective Coating</td>
<td>Paint</td>
<td>Metalizing</td>
</tr>
<tr>
<td>Pier Protection</td>
<td>Concrete</td>
<td>Granite</td>
</tr>
<tr>
<td>Foundation</td>
<td>Spread Footings on Rock</td>
<td>Abut: Micro-piles Piers: 6’ Ø Drilled Shafts</td>
</tr>
</tbody>
</table>
Typical Approach Section
Delta Frame
Tie Girder
Precast PT Slab, Arch Span
Construction
The new bridge will be supported by a total of seven piers. Six of these will be founded on reinforced concrete shafts, 6 feet in diameter, extending up to 100 ft though the lake bottom to anchor into the bedrock. The shafts will be topped with reinforced concrete footings up to 10 feet thick, which will in turn support the piers. The sides of the footings are sloped and they will also be clad in granite masonry, which will help protect them from ice damage and complement the historical significance of the region. On the Vermont side of the lake, the depth to bedrock is shallow enough that one of the piers will be founded directly on the rock.
New York Abutment
Vermont Abutment
Drilled Shaft Design
Pier Foundations
Approaches: On-going throughout construction

The approaches, which include the sidewalks and road leading to the bridge, will be constructed throughout the duration of the project. Once completed, the new bridge will be opened to traffic and the causeways and temporary ferry slips removed.

The inclusion of sidewalks and bicycle accommodations on the bridge, in addition to the selection of this specific bridge design, came about through consultation and collaboration with the people of the region who have a strong understanding of the significance of this crossing.

The New York Approach roadway will remain on the same alignment to avoid impact to the historic Fort St. Frederick and former Champlain Bridge Toll Keeper’s House.

In Vermont, the roadway will be shifted approximately 7 feet to the north of the existing alignment, smoothing the approach roadway curve and minimising impacts to the Chimney Point State Historic Site.

The roadway over the approach spans will be supported by a superstructure comprising 5 lines of I-shaped steel girders, with a height of just over 8 feet.

The steel used for the superstructure is a special type of steel known as weathering steel, which is designed to form a thin coat of protective rust. In addition, the steel will be further protected by a process called metabolizing which will be used instead of paint.

The result will be a low maintenance structure designed with high durability. Once the superstructure steel has been erected, the concrete deck will be cast and the sidewalk and railings installed.
The steelwork of the arch span will be constructed off-site, along the shore of the lake. From there it will be floated into position and lifted into place using steel cables supported on the rigid frames of the approach structures. Once in place, the deck will be constructed of precast concrete panels.

Arch Superstructure: Summer 2011
Questions?