Beaverkill Covered Bridge Rehabilitation

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Prepared by:
Sean James, P.E. – Project Manager
Josif Bicja, P.E. – Senior Structural Engineer
Background

New York

Project Location
• Town Lattice Truss
• Built in 1865
• Last Major Rehabilitation in 1991
• Listed on National Register of Historic Places in October 2007
• Posted for 3 Ton Live Load
• Served as a Subconsultant to Erdman Anthony
Bridge Description

- 116’-0” (End to End of Portals)
- Single Span over Beaverkill
- 1 Lane, 11’-0” Wide Curb-Curb, 16’-3” Out-Out
- 6’-6” Vertical Clearance
- 3 Ton Live Load Capacity Goal
Bridge Description

Downstream Elevation
Bridge Description

East Portal

West Portal
Project Purpose and Need

- Bridge in Poor Condition
  - Broken, Rotted, Split Members
  - Broken Bottom Chord Members
  - Sag in North Truss Spans (-1.0”)
- Preserve Historic Covered Bridge
- Restore Load Carrying Capacity to 3 Tons
Field Observations

In-Depth Inspection
Field Observations

Typical Rafter Bearing

Typical Rafter Break at Bearing
Field Observations

Cross Beam Lifting

Broken Cross Beam
Field Observations

Split Lattice Tail

Broken Lattice Tail
Field Observations

Break at Bottom Chord Ply

Broken Bottom Chord Ply
Field Observations

Oversized Holes – Bottom Chord

Large Gap in Bottom Chord
Field Observations

Break at Bottom Chord Ply

Bottom Chord Repair
Structural Analysis

- 10 Samples (2” by 4” in size) were Tested for Species (Local Species and Predominately Eastern Hemlock)
- Grade Assigned Based on a Visual Examination
- Allowable Stress Design and Rating
- H3 Live Load
- Load Cases
  - Dead + Live + Snow @ Inventory
  - Dead + Live + Snow @ Operating
Structural Analysis
Structural Analysis

• Roof Framing – No Changes

• Upper Bracing – Strengthen Crossbeam Connections

• Floor Framing – Replace Select Members/Rearrange Stringers’ Spacing

• Trusses – Rearrange Bottom Chord Joints, Add Sleeper Beams, Strengthen Bottom Chord Connections
Rehabilitation Project

• Project Awarded to Sullivan County Paving
• Preconstruction Inspection
  ▪ Remove Siding and Deck as Required
  ▪ Jointly Inspect Bridge with the Contractor
  ▪ Order Additional Replacement Material (if Req’d)
  ▪ Time and Cost Built into Contract Documents
  ▪ Recommended for Covered Bridge Projects
Rehabilitation Project

Rotted Stringers

Removing Temp Plywood
Rehabilitation Project

Rotted Stringers

Rotted Chord Members
Rehabilitation Project

Shoring Structure

Installing Work Platform
Rehabilitation Project

Jacking Gages

Jacking Frames
Rehabilitation Project

Installing Lattice Members

Upstream Truss

Photo Credit: Ed Cerny, Friends of Beaverkill Community
Rehabilitation Project

West Portal

Finishing Touches

Photo Credit: Ed Cerny, Friends of Beaverkill Community
Rehabilitation Project

Downstream Elevation – October 2, 2016

Photo Credit: Ed Cerny, Friends of Beaverkill Community
Rehabilitation Project

Downstream Elevation – June 20, 2017

Photo Credit: Ed Cerny, Friends of Beaverkill Community
Summary

- Engineer’s Estimate - Covered Bridge Alone
  - $1.29M Low Bid, $1.26M Engineer’s Estimate
- Bridge Superstructure Completed on June 2017
- Total Construction Cost - $2.6 Million
- Load Carrying Capacity 3 Ton
- Successful Rehabilitation Project
1. What was the Max. Sag Prior to Rehab?
   a) 1”
   b) 3”
   c) 6”

2. What was the Predominant Wood Species used in Original Construction?
   a) Douglas Fir
   b) White Pine
   c) Eastern Hemlock

3. Snow Load in NY is Considered at Inventory Rating Level.
   a) True
   b) False