

# Lessons Learned

## Historic Covered Bridge Rehabilitations

By Sean T. James, P.E.



*Haverhill-Bath Covered Bridge,  
Haverhill/Bath, NH*

### Inspection

A thorough inspection of a Covered Bridge is a critical part of the rehabilitative process. Without it, an accurate scope of rehabilitation and cost estimate cannot be made. Since many parts of the bridge are not easily accessible, a rigging company or a contractor specializing in covered bridge rehabilitation work should be retained during the inspection process to provide better inspection access. Lift equipment can also be used during the inspection phase to improve the accuracy of the inspection. The use of lifts allows for closer inspection of steel rods, supports at the panel points, and other bridge components best viewed from underneath the structure.

Rigging is another useful inspection aid. The rigging provides close-up access to the lower portions of the truss and existing floor framing. Access to this portion of this bridge can be difficult due to location of the bridge over a stream or river.

### Roof Options

Several types of roofs are used on covered bridges, including wood shake roofs, metal panel roofing, standing seam metal roofs, and in rare cases asphalt shingle roofs. Our experience has shown that of these four roof types, the standing seam metal roof is by far the best alternative.

Wood shake roofs, when properly constructed and detailed, can perform well in

a covered bridge application. Wood shake roofs are also historically accurate, since they were originally used on many older covered bridges. The disadvantages of a wood shake roof include susceptibility to fire, additional dead load weight as compared to a metal roof, high cost, and difficulty in ensuring a water-tight surface over the entire roof area. Of the four options listed above, wood shake roofs are the most expensive option, averaging 40%-50% more than a standing seam metal roof.

Metal roof panels are corrugated galvanized steel or aluminum sheets that are attached to the roof purlins, with nails fastened directly through the metal panel. Although this roof material has the lowest cost of the four roof types listed above, it is highly prone to leaking over time since the nails are driven directly through the material.

The standing seam metal roof is the preferred roof type for covered bridges. It is available in a wide variety of colors coating galvanized steel or aluminum. The roof panel is secured to the roof purlins or roof boards by a series of metal clips. The panels are then installed on the roof using the hold down clips. As the next panel is installed, a hand held machine is used in place to make the standing seam. This detail makes it extremely difficult for water to penetrate the roof structure.

### Structural Upgrades

Structural upgrades to an existing covered bridge generally fall under one of three categories: replacement of bridge members with stronger and/or larger members, splicing or adding to existing truss members, or the addition of supplemental support to the trusses. The

strengthening method selected depends on a series of factors including budget constraints, historical considerations, the difference between the desired and the actual live load capacity of the bridge, the type of truss and physical limitations at the site. The key issue to any strengthening of a covered bridge is, if possible, that it be reversible. The splicing of members or adding supplemental supports is generally the preferred method to meet this objective.

### Lighting / Fire Protection

The addition of lighting to a covered bridge is a cost effective method to deter vandalism and improve safety at night. Outdoor “vandal proof” light fixtures can be unobtrusively installed in a covered bridge, generally supported in the upper lateral bracing or located on the side of a chord member where a sidewalk is located. The lighting can be controlled by an adjustable photocell, which can be placed discretely in the bridge to provide illumination during dusk to dawn hours only. The use of timers to regulate lighting in a covered bridge is not recommended, since power outages and daylight savings time can shift the time the lights are on to times other than desired.

The use of fire protection, and fire detection methods, in a covered bridge has been documented to improve the survivability of the bridge during an arson attempt. Since most covered bridges are located in a rural environment they can be a tempting target for arsonists.

### Maintenance

Regular, basic maintenance for covered bridges is the single most cost effective method of preservation. Routine maintenance of a covered bridge generally does not require expensive or



*Slate Covered Bridge, Swanzey, NH*

sophisticated equipment, and can be generally carried out by Town or City forces. It is our opinion that the lack of basic, routine maintenance accounts for the vast majority of rehabilitative work required on covered bridges. Routine maintenance should include at a minimum:

- Removal of sand and dirt annually from the bridge deck, floor beams and lower chords.
- Semi-annual inspection of the roof and repairs to any leaks found.
- Replacement of all damaged or missing siding.
- Repair or replacement of any severely deteriorated or damaged bridge member.

Excessive sand and debris build-up on the lower portions of the truss and floor framing helps trap moisture that accelerates rot. Proper detailing at both ends of the bridge can greatly reduce the chance of rot damage to members from excessive sand build up. This detailing includes additional siding and floor decking at the ends of the bridge to prevent dirt from falling on the lower chords, and proper details at the truss chord bearings to allow air flow circulation to take place.

### Summary

Covered Bridges, with proper care and maintenance can serve the public for in excess of 100 years. It is recommended that a qualified professional engineer with covered bridge related project experience be retained to provide the owner with cost-effective, historically accurate rehabilitation solutions. The engineer should be assisted as needed with rigging, mechanical lifts or partial siding removal to improve the accuracy of the pre-design inspection.

Several types of roofs are used on covered bridges including wood shake roofs, metal panel roofing, standing seam metal roofs, and in rare cases asphalt shingle roofs. Our experience has shown that of these four roof types, the standing seam metal roof is by far the best alternative.

When structural upgrades are required, it is preferred that additions to the bridge be reversible, and allow it to continue to support loads in the manner its' builder intended. The use of supplemental support beams that share load with the bridge is one method previously utilized to accomplish this goal.

The installation of fire detection/protection and lighting in covered bridges is highly recommended to improve safety, deter vandalism and protect the bridge from arson. The use of these measures has saved bridges from heavy damage or complete destruction.



*Swiftwater Covered Bridge, Bath, NH*

Proper detailing and use of materials during rehabilitation projects, as well as regular maintenance, are also very important in preserving covered bridges. Proper routine maintenance can help eliminate or postpone the need for a costly rehabilitation.

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