

PULP MILL BRIDGE
(Paper Mill Bridge)
Seymour Street, Middlebury/Pulp Mill Bridge Road, Weybridge,
spanning Otter Creek
Middlebury
Addison County
Vermont

HAER VT-31
VT-31

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
National Park Service
U.S. Department of the Interior
1849 C Street NW
Washington, DC 20240-0001

HISTORIC AMERICAN ENGINEERING RECORD

PULP MILL BRIDGE
(Paper Mill Bridge)

HAER No. VT-31

LOCATION: Seymour Street, Middlebury/Pulp Mill Bridge Road, Weybridge, spanning Otter Creek, between Middlebury and Weybridge, Addison County, Vermont
UTM: 18.646026.4876231, Middlebury, Vermont Quad.

STRUCTURAL TYPE: Burr through truss covered bridge

DATE OF CONSTRUCTION: 1854

DESIGNER/
BUILDER: Unknown

PRESENT OWNER: Towns of Middlebury and Weybridge, Vermont

PREVIOUS/
PRESENT USE: Vehicular bridge

SIGNIFICANCE: The Pulp Mill Bridge is one of six surviving double-barrel wood covered bridges in the country. It is an integral part of the local roadway network in west-central Vermont and continues to carry heavy vehicular traffic.

HISTORIAN: Researched and written by Lola Bennett, August 2003

PROJECT INFORMATION: The National Covered Bridges Recording Project is part of the Historic American Engineering Record (HAER), a long-range program to document historically significant engineering and industrial works in the United States. HAER is administered by the Historic American Buildings Survey/Historic American Engineering Record, a division of the National Park Service, U.S. Department of the Interior. The Federal Highway Administration funded the project.

Chronology

- 1777 Vermont declares itself an independent republic
- 1785 Addison County established
- 1791 Vermont becomes 14th state admitted to the Union
- 1805 America's first covered bridge built at Philadelphia
Waltham Turnpike Company chartered
- 1806 Theodore Burr patents the Burr truss
- 1812 Waltham Turnpike completed
- 1817 Theodore Burr receives a second patent for the Burr truss
- 1821 Legislature orders Waltham Turnpike Company to repair bridge
- 1822 Theodore Burr dies
- 1824 Vermont's first known covered bridge built at Highgate Falls
- 1828 Waltham Turnpike made free
- 1854 Present Pulp Mill Bridge constructed
- 1860 Pulp Mill Bridge reinforced with a secondary arch
- 1877 Pulp Mill Bridge repaired
- 1973 Pulp Mill Bridge listed on the National Register of Historic Places
- 1979 Pulp Mill Bridge rehabilitated
- 1991 Pulp Mill Bridge repaired
- 2001 Pulp Mill Bridge rehabilitated
- 2003 Pulp Mill Bridge recorded by the Historic American Engineering Record

Introduction

The first documented covered bridge in Vermont was an arch-truss toll bridge built across the Mississquoi River at Highgate Falls in 1824. By the end of the nineteenth century an estimated 500 covered bridges had been built in Vermont.¹ Over time, however, the covered bridges were replaced with new structures, or lost to floods, fires, vandalism, neglect or decay. After the flood of 1927 only 200 were left standing. By 1946, there were 169. Today there are 104.² The Pulp Mill Bridge is one of six surviving double-barrel wood covered bridges in the country. It is an important part of the local roadway network in west-central Vermont and continues to carry heavy vehicular traffic.

Description

The Pulp Mill Bridge was originally built as a single-span, double-barrel Burr arch-truss wooden covered bridge.³ It is now supported by the addition of two stone and timber crib piers, making it a continuous, three-span structure. The total length of the bridge is 199', with clear span lengths of (east to west) 64'-6", 53'-6" and 53'-4". The bridge is 26'-2" wide, with roadway widths of 9'-0" eastbound and 8'-6" westbound.

The principal structural components are four laminated timber arches, one on each side and two at the center, framed into two pairs of multiple kingpost trusses to create an indeterminate composite timber structure. The arches spring from skewbacks on the facewall of the abutments, span nearly 200' and rise 15' (side arches) and 21' (center arches) to the crown.⁴ The side arches are composed of nine 3"x6" planks, notched around and bolted through the posts of the trusses. The center arches are composed of ten 3"x6" planks, notched and bolted on either side of the center truss. Each multiple kingpost truss has twenty-two panels, spaced 9'-0" on center. The upper chord is composed of 8"x10" timbers, scarfed along its length, with vertical posts tenoned into it. The lower chord is composed of two laminae, 7"x13" that clasp the posts. There are 4"x10" diagonal timbers in between the posts. These diagonal have notched and bolted connections and wooden thrust blocks at their upper and lower ends. The outside truss panels at midspan have X-bracing. Hangers, or tension rods, measuring 1" diameter pass through the arch at each panel point and down through the lower chords where the threaded end is fastened with a plate and nut.

The floor system is composed of variable dimension (approximately 6"x10") transverse wooden floor beams on top of the lower chord at each panel point (approximately 9' apart). The floor

¹ Richard Sanders Allen, *Covered Bridges of the Northeast* (Brattleboro: Stephen Greene Press, 1957), p.50.

² National Society for the Preservation of Covered Bridges, *World Guide to Covered Bridges* database, 2001.

³ The earliest written reference to "Paper Mill Bridge" appears to be in the 1876 Middlebury Town Reports. Earlier records refer only to the bridge location. The name "Pulp Mill Bridge" came into use sometime between 1907 and 1912 after a pulp mill was established upstream from the bridge. *Weybridge Annual Reports*, 1884-1920.

⁴ According to timber framer Jan Lewandoski, who has done extensive work on the bridge, skewbacks were added in 1991 on the east downstream side and in 2002 on the west downstream side. "The other arch feet disappear into concrete poured in 1979, where they have unknown bearing and are rotting."

beams support twelve lines of 6"x6" stringers spaced at 2'-10". The floor is 3" planks laid transversely on the stringers, with longitudinal running boards on top. There are timber wheelguards along the roadways.

The upper lateral system consists of 8"x8" tie beams resting on the upper chord at each panel point, and 2"x7" lateral diagonal bracing with variable spacing between the upper chords. There are transverse metal tie rods between every other panel point and wooden sway braces between the tie beams and the posts. Rafters measuring 4"x4", spaced approximately 2' on center, frame onto the upper chord. The rafters tie into an 8"x10" ridgepole supported on posts along the center of the bridge. Standing-seam metal roofing, fastened to spaced board sheathing on top of wooden purlins, covers the gable roof.

Vertical board siding covers the exterior of the bridge to about 1' below the upper chord. The sheathing is fastened to nailers on the outer faces of the trusses. The portals are straight with rectangular openings. In the early 1990s, a glue-laminated timber pedestrian bridge was installed on beams cantilevered from the piers on the southerly side of the bridge (offset about 5'). A metal truss between the pedestrian bridge and the covered bridge carries a 6" utility pipe. The original stone slab abutments have been faced with concrete. The piers (added sometime prior to the 1930s) were originally dry laid stone with timber cribbing on top and cutwaters on the upstream side. They have also been covered with concrete.⁵

History of Bridge and Site

Otter Creek is the longest river in Vermont and afforded abundant waterpower for industrial settlements in the late nineteenth and early twentieth century.⁶ In the early nineteenth century, J. Ingram established a paper mill at the falls near this site. A wood bridge was erected at, or near, this location shortly thereafter.

In 1808 the Waltham Turnpike Company (chartered in 1805) sought permission from the Vermont Legislature to alter its location so that it might pass over "the bridge by the paper mill on Otter creek, which bridge has been lately erected, and may probably stand a number of years."⁷ The legislature granted this request with the provisions that the turnpike company could collect tolls after they had "covered and put a railing on said bridge" and that they should erect their own bridge at the original location within twelve years.⁸

Within a decade, the turnpike company was experiencing financial difficulties, and in 1821 they petitioned the legislature for permission to make the turnpike a public way, except for a short section between Middlebury and Weybridge. The legislature granted this request, with the

⁵ A mid-twentieth century photograph by C. Ernest Walker shows Pulp Mill Bridge with one concrete pier and one stone pier. The second pier was presumably encased in concrete in 1979.

⁶ H.P. Smith, *History of Addison County, Vermont* (Syracuse: D. Mason & Co., Publishers, 1886), p.235.

⁷ "An Act Granting Certain Privileges to the Waltham Turnpike Company," *Acts of the State of Vermont*, 1808.

⁸ Frederic J. Wood, *The Turnpikes of New England* (Boston: Marshall Jones Company, 1919), p. 267.

provision “that the bridge over Great Otter Creek ... shall, hereafter, be rebuilt and repaired, as the case may require, by the said turnpike company and the town of Weybridge, in equal proportion.”⁹ On October 30, 1828, the state legislature declared the turnpike “a free and public road.”¹⁰ The existing bridge became the joint responsibility of the towns of Middlebury and Weybridge.

In 1850, the Town of Middlebury appointed a committee to “make proper examination and inquiry in regard to [the new bridge], and report their doings in the next annual meeting.” A year later, the committee reported back: “We have recently examined the bridge so far as we have been able ... and we are of opinion that the timbers of said bridge have become so defective as to require that the bridge would be rebuilt as soon as the same can be done advantageously.”

Apparently, nothing was done concerning the matter for another year, as town records and local newspapers make no mention of the bridge. On December 29, 1852, the selectmen of the two towns published the following notice to contractors in the *Middlebury Register*:

Proposals will be received by the undersigned for building a covered bridge over the Otter Creek, at Paper Mill Village. Said bridge is to be 176 feet between the abutments. Proposals are solicited for the different styles, with prices of each, and should be sent in by the 15th of January. Middlebury, Dec. 28, 1852.

Calvin Hill, for Selectmen of Middlebury

Samuel O. Wright, for Selectmen of Weybridge

Calvin Hill, a lawyer, was the Middlebury town treasurer in the early 1850s. Among his papers at the Sheldon Museum in Middlebury are several receipts for various items pertaining to the Paper Mill Bridge. One receipt is dated October 13, 1854 from the Town of Middlebury to H. Crane Jr. for “making eight hundred of spikes and 14 day books for Paper Mill Bridge 18.34 [and] making wrenches for same for turning nuts 2.00.”¹¹

The Pulp Mill Bridge reportedly began to have structural problems soon after it was built. This may have been due to the builder overlooking key details, such as shouldering the vertical posts into the chords.¹² In 1859-60, local bridge builder David E. Boyce added secondary arches in an attempt to strengthen the structure and keep it from sagging.¹³ When this method failed to remedy the problem, stone piers were added underneath to shorten the span length. The date of these piers is not known but presumably they were added in the late nineteenth century.

⁹ This may be where the 1820-21 construction date, reported in most contemporary sources, comes from, and which has led to the erroneous conclusion that Pulp Mill Bridge is one of the oldest extant covered bridges in the country. There is evidence, however, to strongly suggest that the present covered bridge was built in 1853-54 as a joint venture between the towns of Middlebury and Weybridge.

¹⁰ “An Act for the Relief of the Waltham Turnpike Company,” *Acts of the State of Vermont*, 1828.

¹¹ Calvin Hill Papers, Sheldon Museum, Middlebury, Vermont.

¹² Jan Lewandoski, conversation with Lola Bennett, February 6, 2004.

¹³ Herbert Wheaton Congden, *The Covered Bridge* (Middlebury, Vermont: Vermont Books, 1959), p.31.

In 1979, the bridge underwent a substantial rehabilitation that included rebuilding the piers and replacing the arches and lower chords. Somehow, three posts with deteriorated bottoms were overlooked, however, and this allowed the arch and chord to sag, causing settlement of the vertical members and shearing of the upper chord connections. In 1991, covered bridge specialist Jan Lewandoski rebuilt the west downstream truss and strengthened the arch. Despite these efforts, the following year Warren Tripp, Structural Engineer of the Vermont Department of Transportation, wrote to the Middlebury Board of Selectmen, “There are some serious problems with this bridge. ...It is our belief that a catastrophic failure could occur with little or no warning.”¹⁴

Although some minor repairs were done to correct problems with the joints and to prevent arch failure, no major structural work was done until 2002, by which time the bridge was bowed and sagging. During the summer of 2002, Jan Lewandoski managed to stabilize the bridge with a new bottom chord, new vertical posts, new shear blocks, new thrust blocks at the center pier and east abutment, new hanger rods from the arch to the bottom chords, and a new metal roof. This work was done at a cost of \$96,500. The Pulp Mill Bridge is presently in good repair and carries heavy daily traffic. Pedestrians use a glue-laminated pedestrian bridge on the south side of the bridge that was built in the mid-1990s with federal highway funds.

Theodore Burr and the Burr Truss

Theodore Burr (1771–1822) is a significant figure in the history of covered bridge building. He built his first bridge in 1801 near his sawmill in Chenango County, New York, and subsequently experimented with a wide variety of timber arch designs for bridges that spanned the Hudson, Mohawk, Delaware and Susquehanna rivers. His masterpiece was the short-lived, 360’ McCall’s Ferry Bridge (built 1815; destroyed by ice 1818), the longest timber bridge span ever built. Burr’s greatest contribution to bridge building, however, was his design for an arch-reinforced truss with a level deck that he patented in 1806 and 1817.

The Burr truss was popular in the mid-nineteenth century for long-span railroad and roadway bridges and thousands of such bridges once existed. Unfortunately, Burr was not a shrewd businessman, and he suffered financial setbacks by accepting company stock in payment and then not being able to pay back his creditors. He died suddenly and mysteriously while supervising construction of a bridge at Middletown, Pennsylvania, and is reportedly buried in an unmarked grave somewhere in central Pennsylvania.

¹⁴ Letter on file in the Middlebury Selectmen’s Office, Middlebury, Vermont.

Sources

Allen, Richard Sanders. *Covered Bridges of the Northeast*. Brattleboro, Vermont: Stephen Greene Press, 1957.

American Wooden Bridges. New York: American Society of Civil Engineers, 1976.

Atlas of Addison County. New York: F.W. Beers & Co., 1871.

Congdon, Herbert Wheaton. *The Covered Bridge*. Middlebury: Vermont Books, 1959.

Conwill, Joseph D. "Burr Truss Bridge Framing." *Timber Framing* 78 (December 2005): 4-11.

Gatchell, Verna B. "Two-Way Traffic of the Past (Double-Barreled Covered Bridges)." *Covered Bridge Topics* 21 (January 1964): 3, 13.

Henry, Hugh H. National Register of Historic Places Inventory-Nomination Form, "Pulp Mill Covered Bridge," Addison County, Vermont, 1973.

McFarland-Johnson Inc. *Covered Bridge Study at Pulp Mill Bridge*. Montpelier Vermont: Vermont Agency of Transportation, 1995.

The Middlebury Register, Middlebury, Vermont, April 1850 - December 1852.

Town of Middlebury, Vermont. *Annual Reports*, 1876-2002.

Town of Middlebury, Vermont. *Town Meeting Minutes*, 1787-1878.

Middlebury Department of Public Works, *Bridge Records*.

Sheldon Museum Archives, Middlebury, Vermont.

Smith, H.P. *History of Addison County, Vermont*. Syracuse: D. Mason & Co., 1886.

State of Vermont. *Acts of the State of Vermont*, 1800-1860.

Swift, Samuel. *History of the Town of Middlebury*. Middlebury: A.H. Copeland, 1859.

Walling, Henry F. "Map of Addison County, Vermont, 1857."

Town of Weybridge, Vermont. *Annual Reports*, 1884-1920.

Wood, Frederic J. *The Turnpikes of New England*. Boston: Marshall Jones Company, 1919.

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The following pages are an addendum to a 7-page report that was previously transmitted to the Library of Congress in 2005. The bridge was since rehabilitated by Alpine Construction in 2012. This work included rehabilitating the trusses, and replacing the arches, floor beams, decking, roof and siding. Since no photographs accompanied the original report, HAER hired Martin Stupich to take both large format and digital photographs of the bridge, shot in April 2015.

ILLUSTRATED APPENDIX

Historic images (fig. 1-3) are courtesy the Richard Sanders Allen Collection, National Society for the Preservation of Covered Bridges. All color digital photographs (fig. 4-15) are by Martin Stupich.



Figure 1. Interior of Pulp Mill Bridge with some of the roofing removed, view looking west. Note the remnant of the original solid arches, just underneath the laminated arches that were added later. Richard Sanders Allen, photographer, ca. 1948.



Figure 2. Interior view showing south lane of bridge, view looking west. Richard Sanders Allen, photographer, ca. 1940.



Figure 3. East portal, view looking west. Richard Sanders Allen, photographer, October 1939.



Figure 4. General view from downstream, view to south.



Figure 5. General view of sub-deck showing 2012 reconstruction: piers, arch detail, vertical plank cladding; view from west bank of Otter Creek to east. (The steel lattice beam is a free-standing structure that carries a water pipe beneath the pedestrian walkway.)



Figure 6. General view of west portal showing north side, view to southeast.



Figure 7. General view of double barrel east portal; view to west.



Figure 8. Detail west portal showing center post, view to east.



Figure 9. Detail, north land to east.



Figure 10. Interior north (westbound) lane showing scale on deck.



Figure 11. Interior detail center posts and roof with truss and deck.

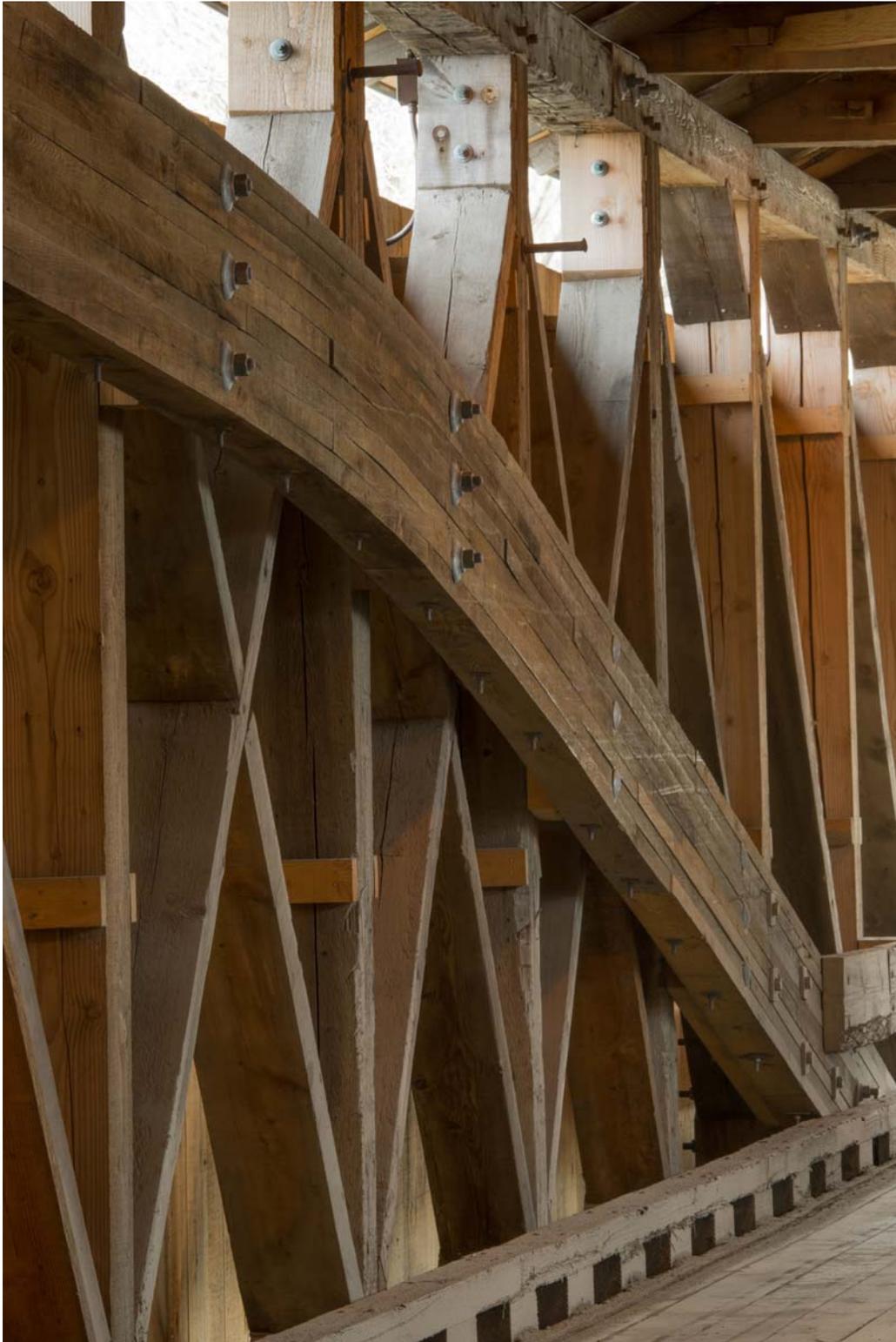


Figure 12. North truss detail, view to east.



Figure 13. North truss showing clerestory and deck, view to east.



Figure 14. Interior, center deck detail showing post and diagonal bracing.

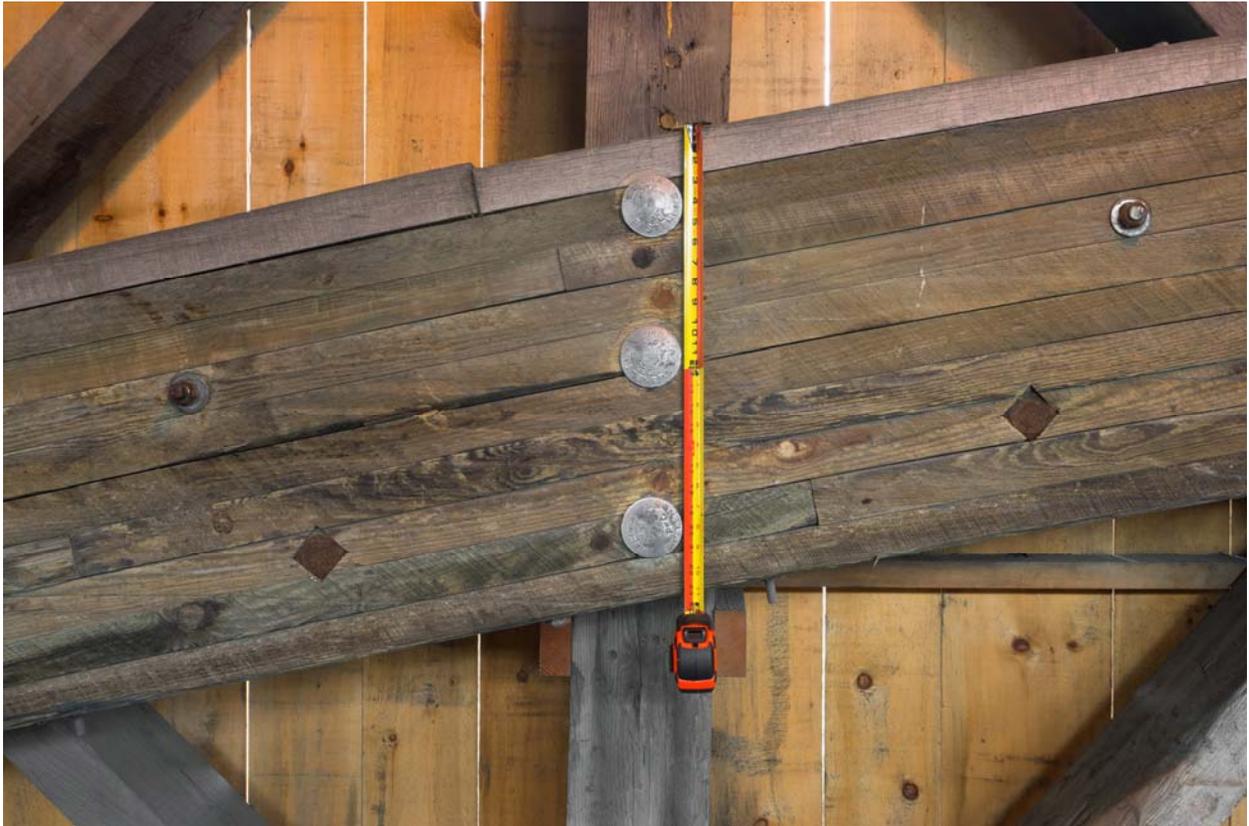


Figure 15. Interior detail of segment of north outboard Burr Arch showing three fastener types: capped through-bolt (center), recessed bolt in square chiseled recess (lower left and right), conventional nut/bolt/washer (upper left and right); note scale; view to north.