SHOREHAM RAILROAD BRIDGE
Former Addison County Railroad (later, Rutland Railroad, Addison Branch), spanning Lemon Fair River above Richville Pond, west of East Shoreham Road
Shoreham
Addison County
Vermont

HAER VT-32
VT-32

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HISTORIC AMERICAN ENGINEERING RECORD
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HISTORIC AMERICAN ENGINEERING RECORD

SHOREHAM RAILROAD BRIDGE
(Rutland Railroad Bridge #A15)

HAER No. VT-32

Location:	Spanning Lemon Fair River at former Addison County Railroad (later, Rutland Railroad, Addison Branch), off East Shoreham Road, Shoreham, Addison County, Vermont UTM: 18.640153.4857708, Orwell, Vermont, Quad.
Structural Type:	Howe through truss covered bridge
Date of Construction:	c1897
Designer/Builder:	Rutland Railroad Company
Present Owner:	Vermont Division for Historic Preservation
Previous Use:	Railroad bridge
Present Use:	Pedestrian bridge
Significance:	The Shoreham Railroad Bridge is a well-preserved example of a covered wood Howe truss, the first bridge truss type to use metal for primary structural members. It is one of eight surviving covered wood railroad bridges in the United States.
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

1840 William Howe patents Howe truss

1870 Addison County Railroad chartered

1871 Addison County Railroad line built

1871 Rutland Railroad leased to Vermont Central Railroad

1873 Vermont Central Railroad reorganized as Central Vermont Railroad

1896 Addison County Line leased to Rutland Railroad

1897 Shoreham Railroad Bridge reportedly built

1951 Addison County Line abandoned

1960s East Shoreham depot and tracks removed

1972 Vermont Division for Historic Preservation takes possession of the bridge

1983 Shoreham Railroad Bridge restored at a cost of $35,014

2003 Shoreham Railroad Bridge recorded by the Historic American Engineering Record

Introduction

Some of the earliest railroad bridges were timber structures because wood was abundant, cheap, and easy to work with. In 1830, Lewis Wernwag built the first wood railroad bridge in the United States for the Baltimore & Ohio Railroad over the Monocacy River in Maryland. Within a short time, wood bridges were commonplace on America's growing network of railroads.

Presumably hundreds of covered railroad bridges were built in the nineteenth century. In 1841, one English traveler noted, "The timber bridges of America are justly celebrated for their magnitude and strength. By their means the railways of America have spread widely and extended rapidly."[1] By the late nineteenth century, most railroad bridges were being built of iron or steel. In 1957, there were only 29 surviving timber truss railroad bridges in the country. Today there are eight. The Shoreham Railroad Bridge is one of only two wooden covered railroad bridges left in Vermont.

Description

The Shoreham Railroad Bridge is a single-span wooden Howe truss covered bridge. The total length of the bridge is 109 feet, with a clear span of 94'-6". The truss is 21'-0" high from the top of the upper chord to the bottom of the lower chord and 19'-4" wide out to out, with a width of 14 feet between the trusses.

Each ten-panel truss is framed in the manner patented by William Howe in 1840. The upper chord is four lines of 6"x10" timbers with shear blocks, bolted together. The lower chord is four lines of 6"x12" timbers with shear blocks, bolted together. The chords are connected by vertical endposts, paired diagonal 7"x9" timbers, 6"x6" counter diagonals and groups of vertical iron tension rods, varying in number and dimension (from two to six in each group and from 1½" to 2½" in diameter). The number of rods increases toward the ends of the trusses: panels 4, 5, 6 and 7 have three 1½" diameter rods; panels 3 and 8 have four rods (two 1½" diameter and two 1¾" diameter); panels 2 and 9 have six rods (four 1½" diameter and two 1¾" diameter); and panels 1 and 10 have five rods (one 1½" diameter, two 1¾" diameter and two 2½" diameter). Panels 1, 2, 3, 8, 9 and 10 also have a third timber between the paired diagonals and two 3"x7" timbers with the counter diagonals. The upper and lower connections at each panel point incorporate triangular cast iron bearing block assemblies, with seats for the diagonal timbers and openings for the metal rods to pass through. Each rod passes through this assembly and through the chord, where it is fastened on the far side with a plate and nut. Some of the diagonal wood members of the trusses have been reinforced with additional timbers. Some of the rods appear to have been added after the original construction.

The floor system is composed of 7"x13" transverse floor beams spaced 2'-0" apart on top of the lower chord. There are two lines of stringers, each composed of a 6"x12" and a 10"x12" timber laid longitudinally on top of the floor beams, along the line of the former rails. The stringers

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[1] Richard Sanders Allen, *Covered Bridges of the Northeast* (Brattleboro, Vermont: Stephen Greene Press, 1957), p.94.

carry transverse railroad ties, and originally, the railroad tracks, which have now been removed and replaced with a wooden walkway.

The upper lateral system is composed of 8"x8" transverse struts resting on the upper chord at each panel point and 6"x6" lateral diagonal bracing between the struts. This system appears to have been raised at some point for additional clearance. There are wooden sway braces between the struts and truss diagonals. Wooden rafters frame onto a longitudinal timber supported on the outer ends of the struts at the eaves. The gable roof is covered with wood shingles fastened to sheathing on top of the rafters.

The exterior of the bridge is covered with vertical board sheathing to the eaves. The sheathing is fastened to wooden nailers on the exterior faces of the trusses. The portals have elliptical arched openings, 13'-6" high. There are suggested capitals on the outer faces of the end posts. There are three 2'-6"x5'-0" window openings each side of the bridge; these are not original, but were added during the 1983 restoration.

The abutments are squared, drylaid stone masonry. The east abutment has a concrete cap; the west abutment is faced with concrete. The lower chords rest on two 8"x10" timbers and one 4"x10" timber on top of the abutment facewalls.

History

In 1870 the Addison County Railroad was chartered to build a line connecting the Rutland Railroad at Leicester Junction, Vermont, with the Delaware & Hudson Railroad at Ticonderoga, New York, a distance of 15.6 miles. The line was laid out from Leicester Junction westward through the towns of Whiting, Shoreham and Orwell across Lake Champlain in New York. The contract for building the road, including a floating bridge across Lake Champlain, was let to W. Phelps & Son, at a cost of about $500,000.[2]

In the southeast corner of Shoreham, the line crossed the county's "only stream of consequence,"[3] the Lemon Fair River, at a hamlet known as Richville[4] (formerly Rich's Mills[5]). A bridge was built here in the fall of 1871, according to the following report from *The Middlebury Register*: "ARR is in running condition from Leister to the Lemon Fair. It will be two weeks before the bridge over the stream will be ready for trains."[6] Another item that appeared in the same paper October 3, 1871 suggests that most of the bridges on the line were Howe trusses:

> *The road is graded the entire length, about fourteen miles, and the iron is laid, except about three miles, which will be laid this week. ...The road has been*

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[2] H.P. Smith, *History of Addison County, Vermont* (Syracuse: D. Mason & Co., Publishers, 1886), p.126; Harold B. Webster, *The Old Addison Railroad*, 1986.
[3] A.J. Coolidge and J.B. Mansfield, *A History and Description of New England*, Volume 1 (Boston: Austin J. Coolidge, 1860), p.903.
[4] F.W. Beers, *Atlas of Addison County, Vermont*, 1871.
[5] H.F. Walling, *Map of Addison County*, 1857.
[6] *The Middlebury Register*, August 29, 1871.

> *graveled about three miles and the whole will be graveled by the first of November. The bridges are all up and are permanent structures, with one exception: where a temporary one has been erected, which will soon replaced by a "Howe Truss" of the same pattern as the others.*[7]

The 1897 Biennial Report of the Rutland Railroad Company indicates that there were four wooden trestles and seventeen wooden bridges (12'-108' span) on the Addison Railroad line. Further information on these other bridges has not been found, but they were presumably minor structures, since the Lemon Fair is the only major watercourse along the railroad right of way.[8] The line was completed in December 1871, and the newspaper reported: "*An excursion train passed over the road on Wednesday and greatly rejoiced the hearts of the people living along the line of the road.*"[9]

The date of construction of the present covered bridge at East Shoreham is not conclusively documented in records found to date. While the railroad was clearly building timber Howe truss bridges on the line in 1871, most modern sources state that this bridge was built in 1897. More recently, the Shoreham Historical Society states that 1891 "may be the true date,"[10] although the author has not seen any supporting documentation for this date. The iron rods in particular are a subject for further investigation—their arrangement and connections have an odd appearance, as if some of them were added later.[11]

What *is* well-documented is the fact that although it first held promise as a freight line, the Addison Railroad primarily served local farmers, carrying dairy products, wool, hay and livestock to market, and the line never turned much of a profit. After the Vermont Central leased the line in 1872 they did not maintain it. Trains were rerouted across the lake at Rouses Point and "very little was sent by way of the Addison Railroad."[12] Within just five years, the line was so badly neglected that trains were limited to speeds of 15 miles per hour. On December 13, 1879 an engine nearing Larabees Point tipped over and rolled down the embankment, killing three people. Although that event was "hushed up" according to historian Harold Webster, local people were determined to bring the railroad's dangerous condition to someone's attention. H.S. Brookins, one of Shoreham's influential citizens, eventually filed a complaint with the Vermont Railroad Commission and a number of subsequent inspections took place. An inspection in 1889 reported that the Addison Railroad was one of the most neglected lines in the state.

According to Webster, sometime shortly after that, improvements were made, because "By 1891, the Addison Railroad had been improved so much with more ballast and repaired bridges

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[7] *The Middlebury Register*, October 3, 1871.
[8] Telephone conversation with Joseph Conwill, July 31, 2003.
[9] *The Middlebury Register* December 17, 1871.
[10] *Shoreham: the Town and its People*. Shoreham, Vermont: Shoreham Historical Society, 1988, p. 60.
[11] According to covered bridge historian Joseph Conwill, it is certainly well within the realm of possibility that this is an 1871 bridge with 1897 modifications, but it could just as easily be an 1897 bridge with World War I-era modifications. If the bridge dates to 1871, it is the oldest covered railroad bridge in the country, which makes it highly significant—but this has not yet been documented.
[12] Webster, p. 21.

that they raised the speed limit to 20 miles per hour." The Vermont Railroad Commissioners Reports, published from 1888, discuss repairs to the line in the 1890s. Regarding the bridges, the commissioners stated in 1894: "The bridges are few and short, but are believed to be equal to the strain which the light traffic of the road exacts."[13] The 1898 report indicates that one new wooden bridge was built on the Addison line during the year ending June 30, 1897, but does not record the location of that bridge.[14] The only written reference to this specific structure in railroad records discovered to date appears in a 1917 valuation of the Addison Branch line, which shows a *"covered timber bridge, stone abutments, #A15"* at this location.[15] While no conclusive documentation has been found to substantiate a construction date, the bridge's heavy construction and unique arrangement of tension rods suggests that the bridge was at least strengthened, if not constructed, in 1891 or 1897.

The Shoreham Railroad Bridge carried trains until 1951, when the Rutland Railroad decided to abandon the line, stating their reasons as "There is little demand for carload freight and the traffic available is not sufficient to warrant necessary outlay for reconstruction and maintenance."[16] The petition was granted and the tracks were pulled up as far as Whiting in 1951 and the remaining tracks pulled up ten years later. Subsequently, the bridge and surrounding property were purchased by the Vermont Department of Fish and Game. The depot at the east end of the bridge was torn down in the 1960s. In 1972 the Vermont Division for Historic Preservation took possession of the bridge in order to preserve it.

With the support of a Federal and matching state grant, restoration of the bridge began in the fall of 1983. The contract was awarded to Vermont Structures, Inc. of Middlebury. The abutments were reinforced, a new deck constructed and the roof and siding replaced at a cost of $35,014. The bridge site is presently a popular spot for fishing.

Design

During the 1830s and 40s, demand increased for standardized bridges that could be rapidly erected and easily maintained to keep pace with the growth of the nation's railroad network. In 1840, Massachusetts millwright William Howe (1803-1852) patented a timber truss with parallel upper and lower chords connected by wood diagonals in compression and iron verticals in tension. First to incorporate iron for primary structural members, the Howe truss improved on Colonel Stephen H. Long's design by replacing the vertical wood members with adjustable wrought iron rods to overcome the inherent difficulty of creating tension connections in wood structures and allow for easier and more efficient prestressing of the members. In the case of the Shoreham Bridge, these rods increase in number and dimension toward the end of the trusses where the greatest member forces occur.

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[13] *Vermont Railroad Commissioners Reports*, 1894, p.83.
[14] *Vermont Railroad Commissioners Reports*, 1898, p.295.
[15] Addison Railroad, Rutland Railroad Company, Office of Valuation Engineer, "Right of Way and Track Map," June 30, 1917. (Copy on file at the Vermont Department of Transportation, Montpelier, Vermont.)
[16] I.C.C. Finance Docket No. 2481, published in Robert D. Jones, *The Central Vermont Railway*, Volume 1 (Silverton, CO, 1981), p.144.

Howe's first bridge, a small railroad bridge over the Quaboag River at Warren, Massachusetts "was so successful that Chief Engineer George Washington Whistler of the Western Railroad gave [Howe] the contract for the biggest bridge on the line"[17]—an enormous seven-span deck truss bridge across the Connecticut River at Springfield, erected in 1842. The Howe truss soon became the most widely used wooden truss for railroad bridges. Railroad engineer Theodore Cooper stated in 1889: "This form of truss grew rapidly into favor, from its simplicity of construction, perfection of detail and satisfactory action under service. For some years it has been the standard form of wooden bridge in use upon our railroads. ...No better railroad bridge up to 150 feet spans could be desired."[18]

Railroads favored the Howe truss design because it offered the rigidity of the Long truss, but had simpler framing connections and could be erected quickly and adjusted easily. An article in the 1878 *Transactions of the American Society of Civil Engineers* stated: "The Howe truss may justly be termed the most perfect wooden bridge ever built; others have been designed of greater theoretical economy; but for simplicity of construction, rapidity of erection, and general utility it stands without rival."[19] Used extensively for railroad bridges in the United States and Europe during the mid-nineteenth century, the timber Howe truss gradually gave way to similar structures with cast iron compression members and wrought iron tension members. [20] There are well over 125 examples of timber Howe truss covered bridges surviving in the United States today, although only four of these are railroad bridges.[21]

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[17] Richard Sanders Allen, *Covered Bridges of the Northeast* (Brattleboro, Vermont: Stephen Greene Press, 1957), p.18.
[18] Theodore Cooper, "American Railroad Bridges," *Transactions of the American society of Civil Engineers* 21 (July 1889): 9.
[19] "Bridge Superstructure," *Transactions of the American Society of Civil Engineers*, 1878, p.340.
[20] Dario Gasparini and David Simmons, "American Truss Bridge Connections in the 19th Century, *Journal of Performance of Constructed Facilities*, August 1997, p.124.
[21] The other three surviving wood Howe truss railroad bridges are Clark's Bridge (HAER No. NH-39) in New Hampshire, Chambers Bridge in Oregon and Harpole Bridge (HAER No. WA-133) in Washington.

Surviving Covered Railroad Bridges in the United States

29-07-07	Contoocook Bridge[22]	Merrimack County, NH	1889	157' Town lattice truss	B&M RR
29-07-09	Sulphite Bridge[23]	Merrimack County, NH	1896	180' Pratt deck truss	B&M RR
45-01-05	Shoreham Bridge[24]	Addison County, VT	1897	109' Howe truss	Rutland RR
29-05-14	Clark's Bridge[25]	Grafton County, NH	1904	116' Howe truss	M&WR RR
29-10-03	Wright's Bridge[26]	Sullivan County, NH	1906	124' Town lattice truss	B&M RR
29-10-04	Pier Bridge	Sullivan County, NH	1907	217' Town lattice truss	B&M RR
45-08-16	Fisher Bridge	Lamoille County, VT	1908	98' Town lattice truss	SJ&LC RR
47-38-01	Harpole Bridge[27]	Whitman County, WA	1922	163' boxed Howe truss	Great Northern RR

[22] See HAER No. NH-38, Contoocook Railroad Bridge.
[23] See HAER No. NH-36, Sulphite Railorad Bridge.
[24] See HAER No. VT-32, Shoreham Railroad Bridge.
[25] See HAER No. NH-39, Clark's Bridge.
[26] See HAER No. NH-35, Wright's Bridge.
[27] See HAER No. WA-133, Harpole Bridge.

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