MEETING HOUSE BRIDGE
(Sinnott Road Railroad Bridge)
Sinnott Road spanning Boston and Maine Railroad,
.1 mile east of Biddeford Road
Arundel
York County
Maine

HAER No. ME-51

HAER
ME
16-ARUN,
1-

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
National Park Service
Northeast Region
Philadelphia Support Office
U.S. Custom House
200 Chestnut Street
Philadelphia, P.A. 19106

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Location: Sinnott Road, spanning Boston and Maine Railroad, .1 mile east of Biddeford Road
Arundel
York County, Maine

USGS Kennebunk Quadrangle
UTM Coordinates: 19.377820.4806810

Date of Construction: 1908

Engineer: Boston and Maine Railroad

Present Owner: Guilford Transportation Company
Iron Horse Park
North Billerica, MA 01862

Present Use: Vehicular bridge

Significance: Meeting House Bridge has state-level significance as an increasingly rare example of timber-truss bridge technology. Howe-patent trusses such as this, combining wooden compression members with wrought-iron tension rods, were widely used by railroads because of their low initial cost, easy construction, and durability if properly protected from the weather. The Boston and Maine Railroad had a special affinity for wooden bridges, which it continued to build as late as the first decade of the 20th century.

Project Information: This documentation was undertaken in accordance with a Memorandum of Agreement between the Federal Highway Administration and the Maine State Historic Preservation Office. The bridge is scheduled for replacement in 1994.

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Description*

Meeting House Bridge is a timber Howe-type boxed pony truss carrying Sinnott Road over the Boston and Maine Railroad in Arundel, Maine; although formerly a double-track right-of-way, only the west track is now in place. The surrounding area is a rural residential neighborhood, with scattered houses, mostly of modern construction, nearby. The immediate setting of the bridge is overgrown with bushes and trees, especially on the southeast side. Except as noted, the following general dimensions were taken from field measurements; the minimum clearances given in the Bridge List (see Bibliography) were substantially the same as field-measured:

Overall length:	59' 11"
Span between abutments:	53' 1" (from Bridge List)
Vertical clearance:	17' 7" (from Bridge List)
Depth of truss:	9'
Roadway between trusses:	20' (excludes curb)
Skew:	35 degrees

The abutments are set onto ledge outcroppings and consist of a coursed ashlar of rough-cut granite blocks, 2' high and varying between 1 1/2 and 7' long. The abutments run back about 6' to contain the fill for the roadway, which is sharply ramped on both ends to achieve grade separation. The abutments rise about 13 1/2' above the tracks; the remaining 4' of clearance is provided by a cribwork of 10" and 12" creosoted timbers.[1] The bridge bears on end beams supported by wooden frames built atop the stone abutments.

The bridge consists of six panels of 10' length and follow the standard Howe truss pattern of vertical tension rods and wooden diagonals; the bridge has inclined end posts and counter diagonals in the middle two panels only (see Schematic, p. 10). Not all elements of the trusses could be measured; however, breaks in the sheathing from vehicular damage made portions of most elements accessible. The bridge appears to be symmetrical about its center line. The following are dimensions of the truss components, which, by

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*The author gratefully acknowledges the generosity of Nelson H. Lawry in making available his transcriptions of information from the railroad's maintenance records and the Bridge List.

means of microscopic analysis of small samples, were determined to be Southern pine:

End posts:	8 1/4" x 12", beginning at a point 2' in from the ends of the bridge.
Top chord:	Not accessible; in all comparable examples, the top chord has the same dimensions as the end posts.
Bottom chord:	Two 8 1/2" x 12" pieces, separated every 5-6' by spacers measuring 12" long by 1 3/4" thick. The lower chord pieces are spliced in several places using a longer spacer and a similar piece on the outside of the splice.
Diagonals:	First diagonal, 5 1/2" x 10" ; second diagonal, 6" x 8"; counters, 6" x 8 1/2".
Verticals:	1 3/4" iron rod, threaded on the bottom end (only one mid-bridge vertical accessible).

Except for the individual components of the lower chord, all timbers are set with the longer dimension horizontal.

Each lower end joint of the bridge has a cast-iron wedge or bearing block mortised into the lower chord, into which is set the end post; the bottom of the end post is secured by bolts running diagonally through the lower chord. The other diagonal components appear to be set directly into mortises in the lower chord, though the specific detail was not visible. The vertical tie-rods have bearing plates set into the underside of the lower chords, where they are secured by square nuts. The end verticals have larger plates than those in the center of the bridge. None of the top-chord joints was visible.

Instead of following the 35-degree skew, which results in the trusses being offset by 14', the floor beams are set perpendicular to the trusses. The beams measure 7 3/4" x 11 1/2" and are spaced approximately 2' on center. They are hung from the lower chords with 1" bolts, with the tops bearing against plates set on wooden blocks measuring 8" x 12" x 2 1/2" and the bottom nuts secured against small plates set into the underside of the beams. Pine floor boards, typically

2 1/2" x 7 1/2", are spiked directly into the beams. A wooden curb, 6" x 11", runs along both sides of the roadway, resting on small blocks through which it is bolted to the beams.

The trusses are each braced by a single diagonal outrigger mortised into an extended floor beam, one near the southeast corner of the bridge and one near the northwest corner. These braces extend from about 6' out from the bridge to the top chords.

The trusses are enclosed by 7"-wide hemlock tongue-and-groove boards nailed to 1 3/4" x 4" nailers. Instead of following the slope of the inclined end posts, the enclosure has square ends framed with 3" x 5" paired uprights. The top surface of the enclosures is set at an angle of about 20 degrees, forming a "roof" finished with two layers of tongue and groove sheathing and rolled asphalt. Vehicular collisions have necessitated the replacement of all of the lower part of the south-truss inside sheathing and much of the north side as well, mostly with plywood. On each outer side of the sheathing, near the brace, is a small signboard; on other bridges of this type, the signboards were used to display the milepost designation of the bridge.

Although the condition of the trusses appears to be good, the sheathing and much of the flooring is weathered and damaged. One floor beam has failed and has been supported from below by a timber pylon. The bridge maintenance files in the possession of the railroad's current owner document the replacement of the floor beams in 1925, other substantial but unspecified repairs in 1938, and the raising of the bridge to its present height in 1951.

The name of the bridge, Meeting House Bridge, was used by the railroad in its internal records, reflecting an adjacent landmark (see Historical Background section); it also was known as Bridge No. 98 in railroad records of the period. The bridge is numbered as Bridge No. 1273 in the records of the Maine Department of Transportation.

Historical Background

This crossing was known as Meeting House Bridge because immediately east of the tracks stood the Kennebunkport Center Methodist Church (no longer extant), built in 1858. By 1873, when the railroad went through, a small settlement had grown up at this point, including not only the meetinghouse but also a district schoolhouse (still in place) and several nearby dwellings. This was not the primary bridge in the area, because just to the north was another crossing, now abandoned, that allowed Biddeford Road (at that time considered the main road) to run on the east side of the tracks and join what today is known as Lombard Road; Sinnott Road was a relatively minor side road serving local needs.

The first bridge on the site that is the subject of this documentation is dated 1873 in the railroad's records, indicating that the grade-separated crossing was established at the time the line was built. This route, extending from South Berwick to Portland, was opened for passenger service on March 17, 1873, marking the completion of the Boston and Maine Railroad's own main line between two of New England's largest cities.

Prior to 1870, the Boston and Maine relied on an agreement with the Portland, Saco and Portsmouth Railroad to provide service between South Berwick and Portland, an arrangement also extended to the B. & M.'s rival, the Eastern Railroad. Believing that they could negotiate a better deal, the management of the Portland, Saco and Portsmouth terminated its leases with both of the other railroads in 1870. The Eastern Railroad then offered a substantially higher payment and was awarded exclusive rights to the tracks. This in effect terminated the Boston and Maine at South Berwick and cut it off from almost all of Maine's freight and passenger business.

To survive, the B. & M. secured the right to build a parallel route to the east of that leased by the Eastern Railroad. In little over a year, at great expense, the B. & M. completed its line and once again had access to Portland. Though built in haste and exceptionally expensive, the route was considered a model for its time, with all the railroad bridges made of iron and substantial masonry used throughout. In addition to Portland, the route passed close to Old Orchard Beach and thus benefitted from the tremendous expansion of vacation travel that occurred in the late 19th and early 20th centuries. Starting in Portland in the 1880s, the B. & M. began double-tracking the line, which, reflecting a Boston perspective, was considered part of its Western Division.[2]

This particular segment remained a single track until 1907, when work resumed on double-tracking the final segments of the line. The work, which included replacing the earlier bridge at this site with the present one, was finished the following year. Since the two abutments have nearly identical stonework, it is assumed that both were rebuilt to accommodate the wider span of a double-track overpass.

Technological Significance

The Howe truss, patented by William Howe (1803-1852) of Springfield, Massachusetts, in 1840 and further refined in 1846, represented a substantial improvement in timber-truss technology. By exploiting wrought iron's vastly greater strength under tension, while retaining wood[3] for the compression members, Howe's design achieved a combination of strength and low cost that made it a popular choice for both railroad and highway bridges for decades. Howe trusses were fairly easy to assemble, especially if the joints used the iron wedge-shaped bearing blocks such as those at the critical end joints of Meeting House Bridge (such blocks were part of Howe's patent). The Howe truss also had the advantage that it could be easily tensioned to take up the slack that inevitably occurred as timber bridges aged. Several hundred Howe trusses were built as farm road crossovers on the Erie Canal using general designs developed by Squire Whipple, whose influential engineering texts further popularized the Howe truss in the 1870s and 1880s.[4]

Paradoxically, railroads were both the key agents in developing metal-truss technology and the last to make extensive use of timber trusses. Despite the opulent life-style of their owners, the lavish architecture of their stations, and often a no-expense-is-too great attitude during initial construction, railroads in the 19th and early 20th centuries typically went through periods of extreme financial duress, leading them to keep the cost of improvements to a minimum. For many, wooden bridges continued to offer the right combination of low initial cost and reasonable service. Not only was the basic material easily available, but wooden bridges could be assembled by crews with little in the way of specialized skills. Railroads throughout the U.S. and Canada continued to build wooden bridges, both as railroad bridges and highway overpasses, well into the 20th century.

The Boston and Maine Railroad was especially active in wooden bridge building, and for good reason: consolidating its hold on the region's rail traffic had exacted a high toll on the company's finances.[5] As the company's chief bridge engineer, J. Parker Snow, reported in 1895, more than half the

B. &. M.'s new bridges were being built in wood. Snow defended his employer before the engineering profession by disputing the notion "prevalent in many quarters that such construction is obsolete and out of fashion."[6] Snow's rationale was based primarily on the low initial cost of wooden bridges. He went on to claim, however, that if timber bridges were well-protected from weather and moisture by sheathing, as is Meeting House Bridge, they would last 40 to 50 years. Other advantages were that wooden bridges, more than metal ones, gave notice of impending weakness before they failed, and such bridges could better be entrusted "to the care of workmen not technically educated." Lastly, fire, the chief enemy of timber bridges, was far less of a problem with the coal-burning locomotives of the 1890s than it had been with earlier wood-fired engines.

In the 1890s and early 1900s, the Boston and Maine Railroad built hundreds of wooden bridges, using standard designs developed by the railroad's engineering staff. Typically, boxed pony Howe trusses such as Meeting House Bridge were used for spans in the 30 to 60 foot range, with hard Southern pine as the railroad's preferred material for the trusses. All the known examples are similar, most featuring some form of sway bracing and closely spaced floor beams (so as to spread the load more evenly) and incorporating many virtually identical components, such as the floor beam hanger blocks, the two-part lower chord, and the sheathing details used in this bridge.

Today it is believed that only 10 of the dozens of similar boxed pony bridges built by the Boston and Maine Railroad survive, many in a highly deteriorated condition.[7] Meeting House Bridge, though built substantially out of the period of its technology's initial development, is thus an important survivor. With more than 85 years of service, double the life expectancy of its builders, the bridge testifies to both the economic constraints that marked turn-of-the-century railroad operations and to the enduring value of William Howe's design.

NOTES

1. Dimensions of wooden elements are actual measurements to the nearest 1/4", taken wherever accessible; however, the larger pieces vary by as much as 3/4" over their length, probably due to uneven shrinkage.

2. This nomenclature produced an odd situation in Maine, since the tracks of the Western Division ran to the east of the Eastern Division of the B. & M. The latter name reflected the consolidation of the Eastern Railroad into the B. & M.'s system, which was finalized in 1890 after years of ruinous competition followed by stockholder lawsuits. The consolidation gave the B. & M. sole control of the two routes to Portland.

3. Howe's patent allowed for the use of iron for the compression members instead of wood, and all-iron Howe trusses were built, but it is as a composite iron and timber truss that the design enjoyed its widest use.

4. See, for example, the six-panel Howe truss illustrated in Whipple's An Elementary and Practical Treatise on Bridge Building (New York: D. Van Nostrand, 1883), p. 297.

5. In addition to outright payments in cash and stock, the B. & M. was saddled with numerous lease arrangements made by the railroads it consolidated into its system.

6. J. Parker Snow, "Wooden Bridge Construction on the Boston and Maine Railroad," Journal of the Association of Engineering Societies 15 (July 1895): 31.

7. Nelson H. Lawry, "Boston & Maine's Boxed Ponies: Galloping Into Oblivion?" Trains, February 1994: 48.

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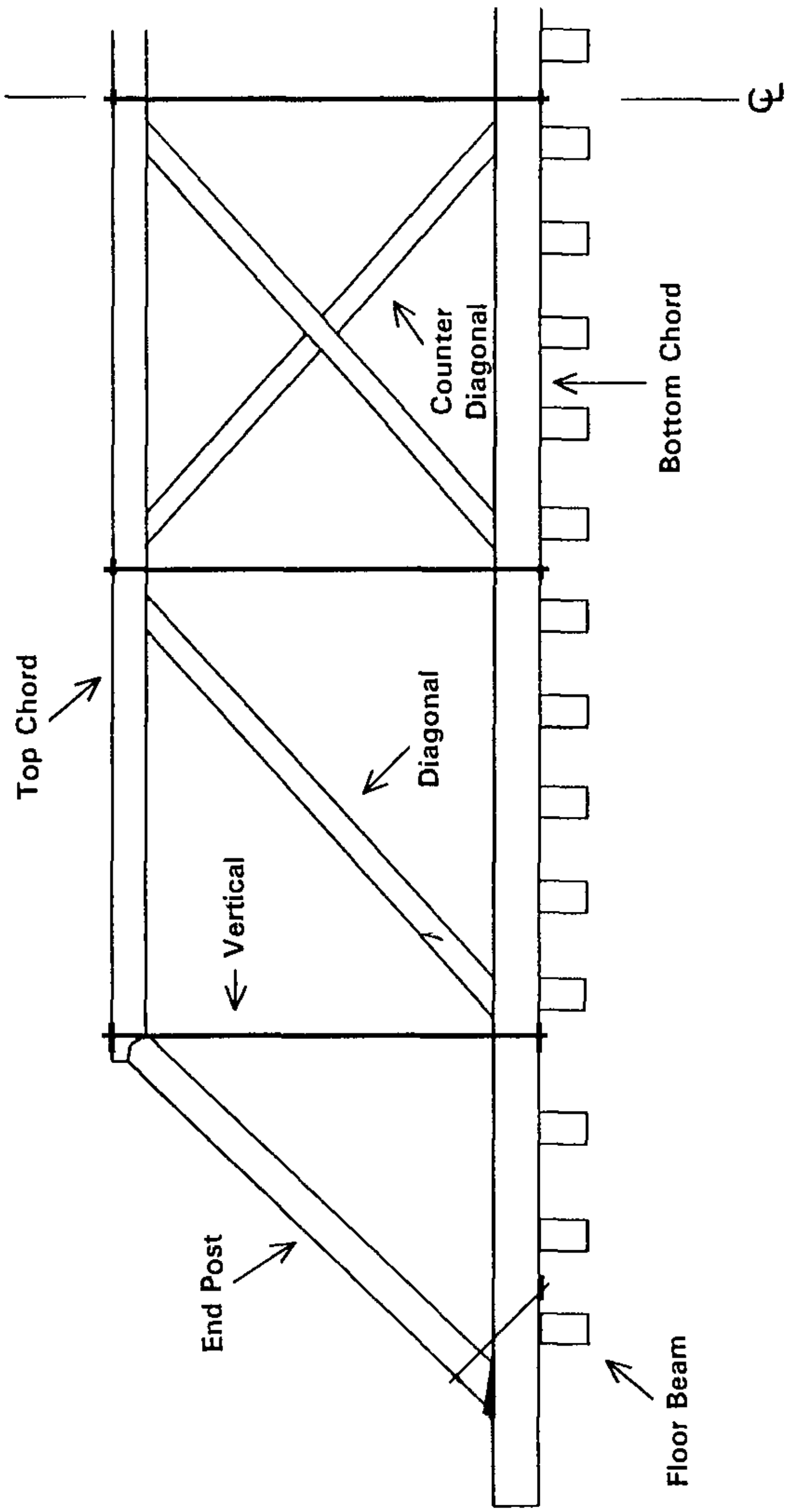
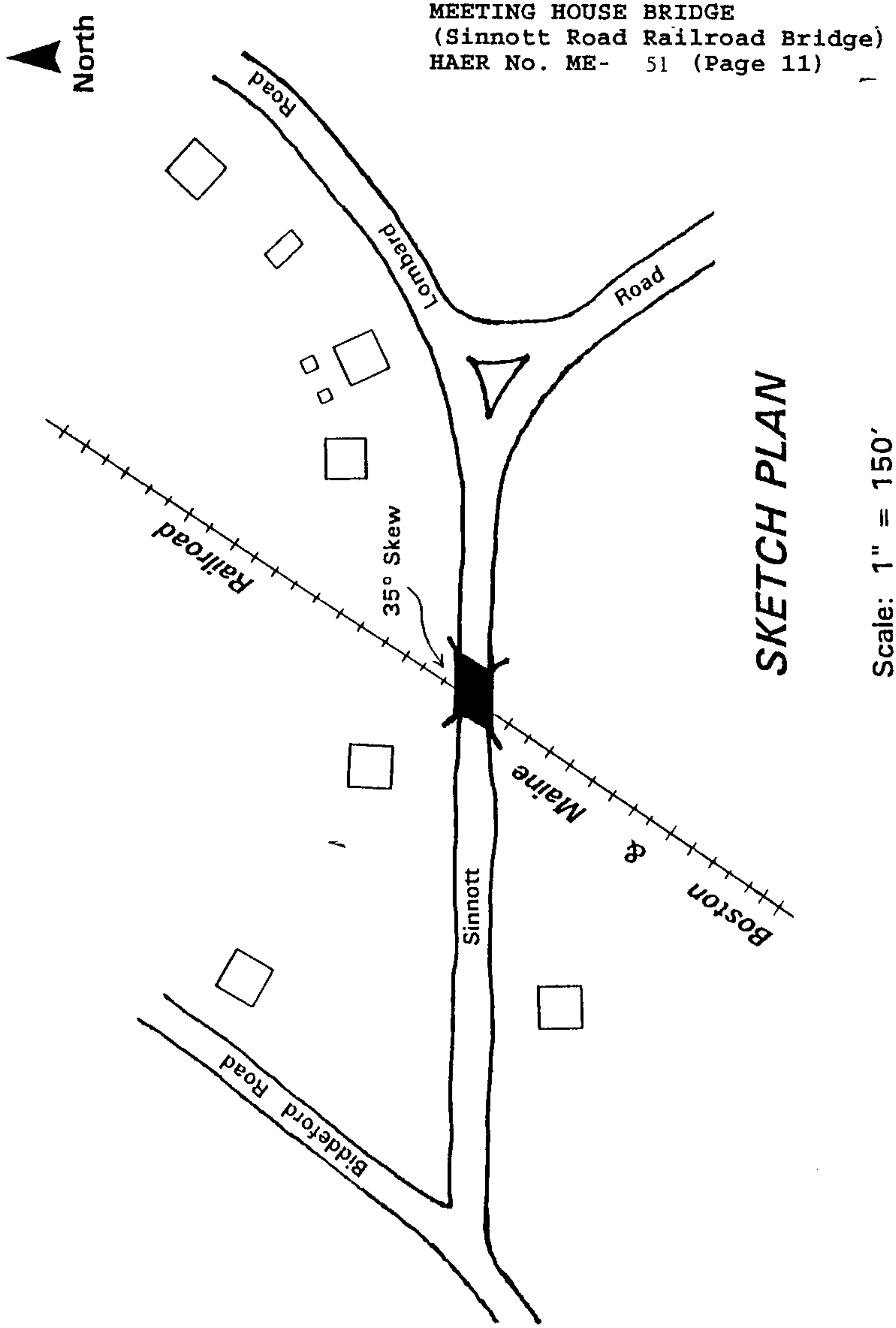
U.S. Patent and Trademark Office. Patents No. 1685 (July 10, 1840); 1711 (August 3, 1840); 4626 (August 28, 1846).

Note on historical photographs and plans: the records of the railroad, the Boston and Maine Railroad Historical Society, and the Maine Railroad Commissioners (Maine State Archives) all failed to yield historical plans for the bridge, nor were there any historical photographs discovered in these repositories.



Schematic of Symmetrical Bridge Truss

Scale: 1" = 4'


North
Lombard Road
Road
Railroad
35° Skew
Boston & Maine
Sinnott
Biddeford Road
SKETCH PLAN
Scale: 1" = 150'