Massachusetts Cultural Resource Information System
Scanned Record Cover Page

Inventory No:	LAN.919
Historic Name:	Atherton Bridge
Common Name:	Bolton Road Bridge
Address:	
City/Town:	Lancaster
Village/Neighborhood:	Five Corners
Local No:	
Year Constructed:	
Architect(s):	
Architectural Style(s):	
Use(s):	Other Transportation
Significance:	Engineering; Transportation
Area(s):	
Designation(s):	Nat'l Register Individual Property (9/10/1979)

LAN 919

MASSACHUSETTS HISTORIC BRIDGE INVENTORY

Municipality: Lancaster   District: 3

Street name/Rt. #: Bolton Rd.

Over

Street name/Rt. #: Nashua River

Bridge key #: MUN 324 003 100   Photo ##s: Dist 3 photos.

Bridge plan #: L-2-4   HBI 70:20-23; 73:31-36

Common/historic name: Atherton Bridge

Current owner:

UTM coordinates: AASHTO rating: 20 (1-25-89)

****

National Register status (insert date)

Entered: 9/10/79   Potential:

Eligible: Non-eligible:

Field rating: (3) 2 1

****

Date built (source): 1870 (B.H., NR nomination)

Date(s) rebuilt (source):

Builder (source): J.H. Cofrode & Co., Philadelphia (B.H.)

Designer (source):

****

Structural type/materials: 910

pinned and bolted, wrought- and cast-iron, 11-panel, Post-type pony truss. Truss verticals are inclined, 4-part Phoenix columns, as is the anomalous inclined strut between the first two verticals. Built-up upper chord of rolled channels w/a riveted cover plate. Iron castings pinned inside the upper chord box accept the ends of the verticals and diagonals. Diagonals are paired rods with loop-eye upper ends, threaded lower ends that pass through lower chord cast fittings. Additional sets of 2-panel diagonals in the 3 outer panels at ends of each truss. End posts are paired hollow compression tubes flanking an adjustable tension rod. Lower chords are*

Overall length: 76'   Deck width/layout: 21' out-out

Skew: -

Main unit, # spans: 1   lengths: 72'

Approaches, # spans: -   lengths: -

Plaque: No   location: -

Alterations, unusual features, comments:

*continuous wrought-iron bars; 2 bars in end panels, 4 bars in interior panels. Floorbeams - original rolled iron I-beams rest upon and are clamped to the lower chords at a point near each panel point; additional timber stringers are notched over and rest upon the lower chord at intervals between the iron floorbeams. No lower chord lateral bracing. Two outrigger sway braces (single iron rods) on outer faces of each truss.

Dry-laid, large-block, roughly squared, roughly coursed granite abutments. U abutments, head walls much more regular than wing walls.

Trusses damaged and deteriorated, but do not appear to have been significantly altered. NE end post gone completely; some upper chord/inclined vertical joints now open.

LAN.919

Visual quality (bridge and setting): High____ Average X Low____

Site integrity: Retained____ Violated X

Describe: In a rural, formerly agricultural area in the Nashua River flood plain. A cornfield still comes down to the river SW of the bridge; a mid-20th c subdivision now occupies the terrace to NW. Overgrown eastern bank shields a small industrial plant to NE.

History of bridge and site:

[see attached copy of the Atherton Bridge National Register nomination]

The Atherton Bridge is a (possibly unique) variation on the metal truss bridge type invented by Simeon S. Post in the 1860s. The Atherton trusses display the inclined web verticals which were first used by S.S. Post in a bridge erected in 1865,-- these inclined verticals being the clearest hallmark of a Post truss. Post, however, never patented the inclined vertical idea, and the 4 specific features which Post did patent (US Patent # 38910, issued June 16, 1863) are not used in the Atherton Bridge trusses. (All of Post's patented features had to do with the design of the upper and lower chord joints in metal trusses, and were intended to allow the chords to expand and contract without inducing additional stresses in the truss web members.) The Atherton Bridge trusses also differ considerably from the standard Post design in the overall configuration of the truss web members, specifically-- in the mixture of single- and double-panel diagonals; in the absence of counter-diagonals; and in the inclusion of the odd, Phoenix column compression strut between the first and second inclined verticals at the ends of each truss.

Sources: E.T. Durfee / P. + L. Farnsworth, Atherton Bridge National Register nomination, 7/1/79
B.H. ✓ United States Patent # 38,910

****

Summary statement of significance:

Tied (with F-4-13, the Lower Rollstone Bridge in Fitchburg) as the oldest known metal truss bridge in the MDPW database.

One of only 2 known Post/Post-type metal truss bridges known to survive in the entire United States. (The other being the 1871 Ponakin Bridge, L-2-8, located only a few miles away.)

The Post was a significant bridge truss design, used for numerous major long-span bridges in the period 1865-1880. The Atherton Bridge is a possibly unique variant on the standard Post design, borrowing only the idea for the inclined web verticals. The Atherton Bridge, built by the little-known Philadelphia firm of J.H. Cofrode & Co., makes a fascinating comparison with the pure Post truss design of the nearby Ponakin Bridge, built by the Watson Manufacturing Co. of Paterson, N.J., which was licensed by S.S. Post to build his patented trusses.

The oldest of only 3 known surviving bridges in the MDPW database (E-10-6/W-15-5 and F-7-11 are the others) to use the patented Phoenix column compression member.

Statement prepared by: S.J. Roper Date: 8/28/89

****

Field survey by: S. J. Roper, MDPW Historic Bridge Specialist Date: 8/14/86

LAN.919

BRIDGES PREVIOUSLY REVIEWED BY M.H.C. -- CONCURRENCE REAFFIRMED

	Municipality	On/Over	Br. Dept. No.
Bridge:	Lancaster	Bolton Rd./Nashua River	L-2-4

has previously been reviewed by the Massachusetts Historical Commission and was ~~determined to be~~ entered in the National Register on 9/10/79.

After a review of all known bridges of comparable structural type identified in the M.D.P.W. statewide computerized database, the M.D.P.W. now reaffirms its concurrence with that initial determination.

Summary statement of significance:

An extremely early and probably unique metal truss bridge -- tied for the oldest known metal truss bridge surviving in the MDPW database.

This is a bridge of national significance.

Statement prepared by: S. J. Roper, MDPW Historic Bridge Specialist

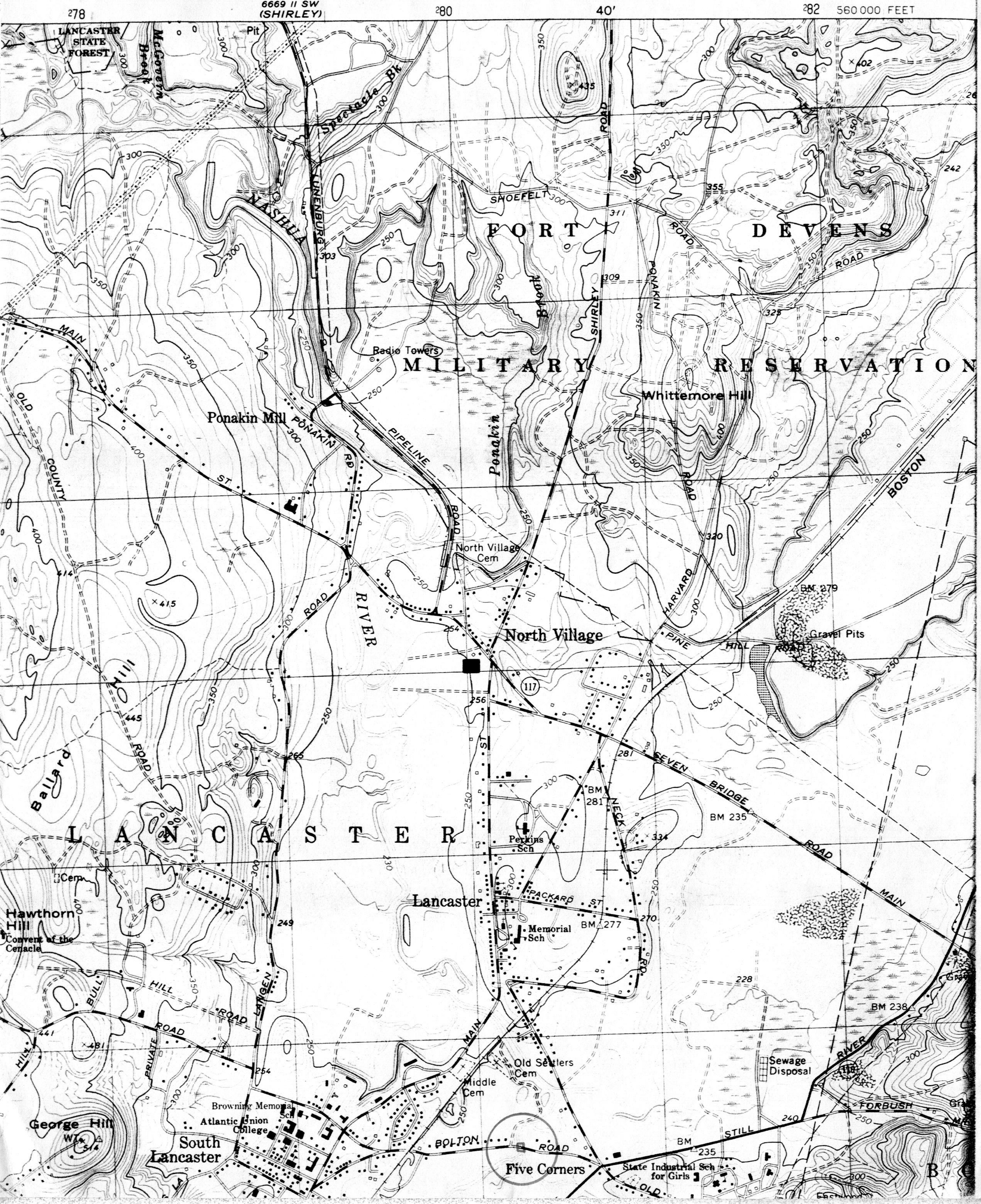
Date: 8/28/89

COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF PUBLIC WORKS

L-2-4 CLINTON QUAD

LAN 919

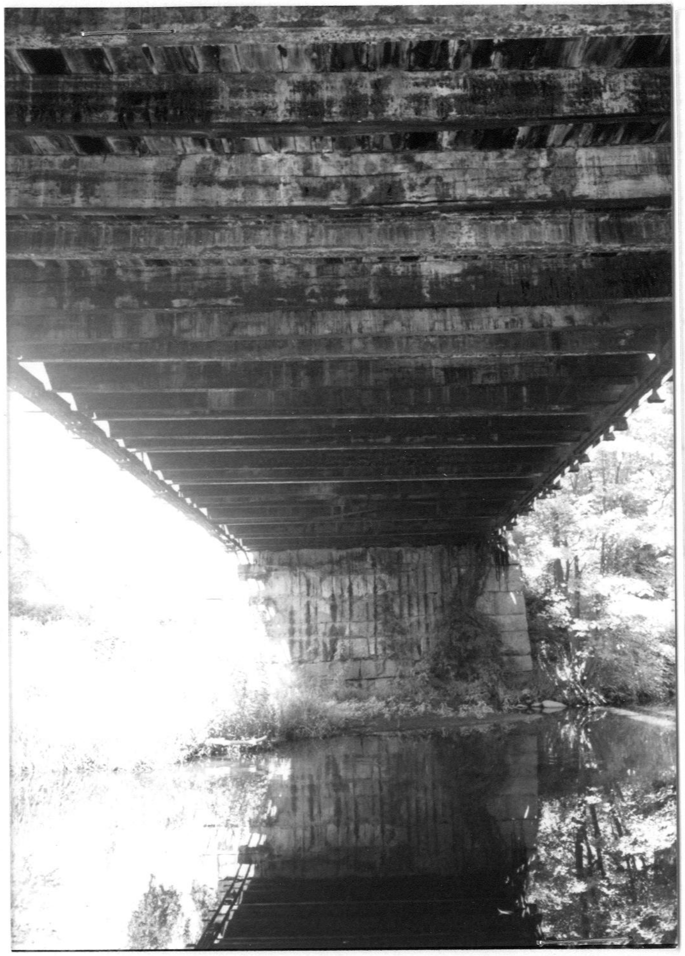
MASS
7.5 MI



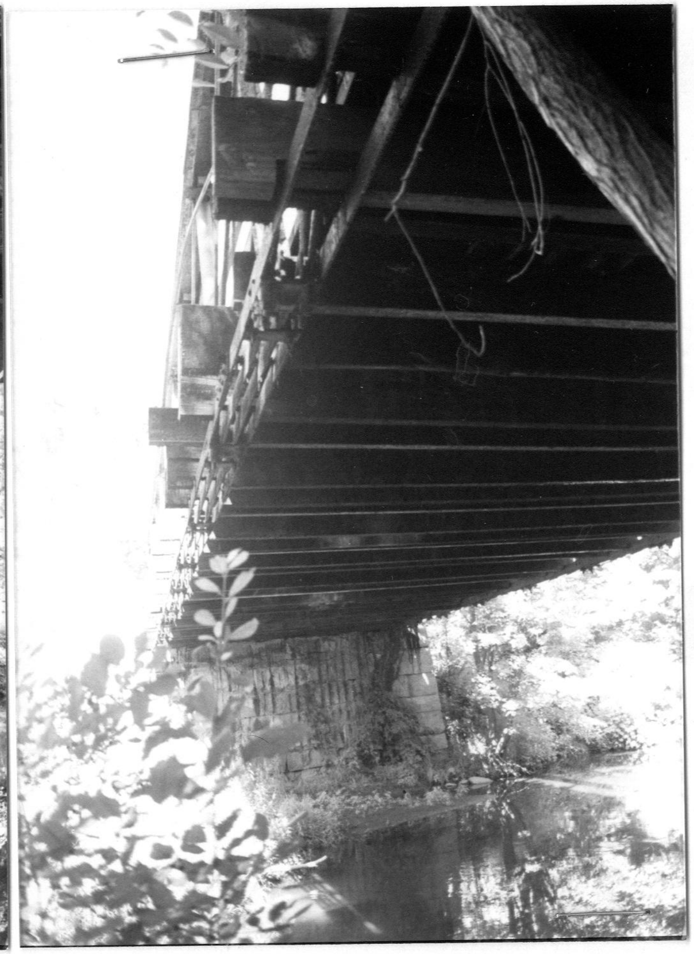
ELEVATION LOOKING NORTH (4/24/79)

NO DATE

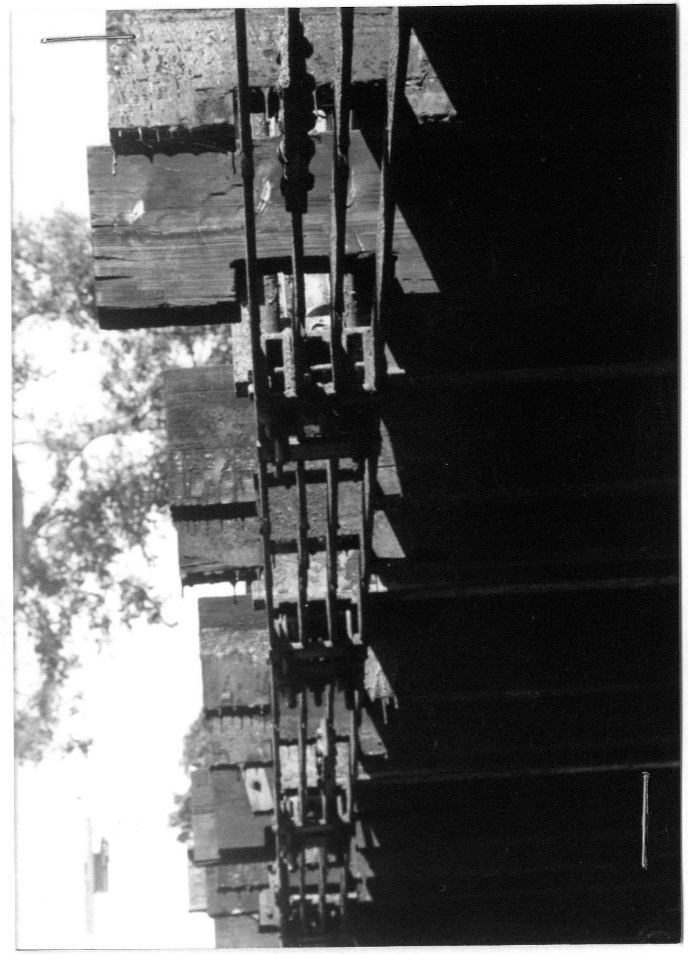
NO CAPTION, DATE
c. 1979 ?



FROM E ABUTMENT, LOOKING W



FROM S AND E ABUTMENT, LOOKING WEST

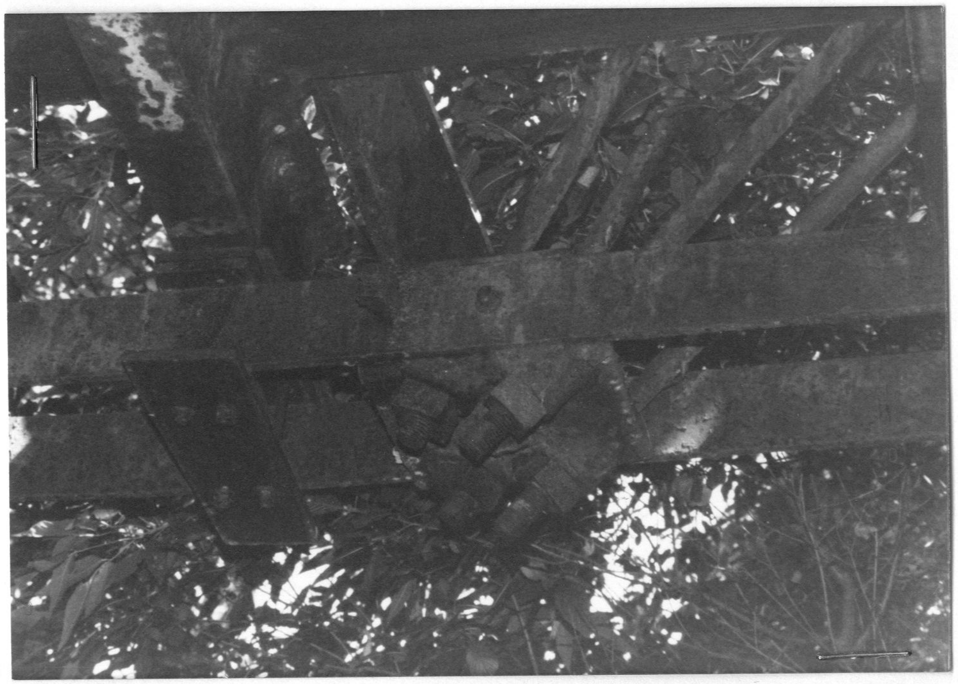


SOUTH TRUSS. LOWER CHORD

8-14-86

N TRUSS, INTERMEDIATE UPPER CHORD PANEL POINT, WITH DISPLACED POST

SOUTH TRUSS, LOWER CHORD PANEL POINT



N TRUSS, LOWER CHORD PANEL POINT

S. TRUSS, LOWER CHORD PANEL POINT

8-14-86

S TRUSS, E ENDPOST UPPER CHORD CONNECTION, FROM E

S TRUSS, 2nd INTERMEDIATE UPPER CHORD PANEL POINT, FROM E

UPPER CHORD INTERMEDIATE PANEL POINT

8-14-86

LAN.919

TO: BETSY FRIEDBERG

RETURN TO REVIEWER BY ______ (DATE)

FROM: WM. SMITH

DATE: 12/10/90

TOWN: Lancaster

PROPERTY: L-2-4 Bolton Rd over Nashua River
(NAME AND ADDRESS)
"Atherton Bridge"

1. Does this property meet the criteria for NR eligibility?

[X] YES put on National Register. 9/10/79

[ ] NO

A. Criteria
   a. events
   b. lives
   c. characteristics
   d. information

B. Local ______ State ______ National ✓

2. Statement of Significance: OR Why not eligible?

1870 pinned & bolted wrought iron & cast iron
Post type pony truss

very Early & unique metal truss bridge.
National Significance.

Recorded summer of 1990 by HAER team
as part of the Massachusetts Bridge project

[ ] DOE LETTER WRITTEN

FILED IN ER FILE ______

______
(DATE)

No inventory in area, or other resources discussed in NR nomination.

MV 2/6/91

Chicopee/Holyoke C-13-12/H-21-30 Cabot Street (Rte. 116) over Conrail LAN.919

1891 Six span steel Pennsylvania through truss. Oldest of the five known Pennsylvania through trusses and is one of the earliest known steel bridges in Massachusetts. Designed by Edward Shaw and built by the R.F. Hawkins iron works.

Dalton D-1-11 Holiday Road over Wahconah Brook

1894 One span Ball Queenpost pony truss. One of only two surviving examples of Charles Ball unique patented pipe truss bridge. Previously reviewed by the Massachusetts Historical Commission and determined eligible 10/6/81.

Erving/Montague E-10-3/M-28-0 Central Vermont Railroad over Millers River, Newton Street

1905 Five span pin-connected Pratt deck truss. Impressive example of a pin-connected long span deck truss which was favored by American railroads in the 19th century. Bridge is eligible individually and as a contributing element to a potential National Register District.

Framingham F-7-5 Main Street over Sudbury River

1878 Rare wrought iron bowstring arch pony truss. It is the only known surviving bowstring metal arch in the Massachusetts Department of Public Works database. It is one of six surviving metal truss bridges in the MDPW database built prior to 1880.

Holyoke/South Hadley H-21-1/S-18-4 State 116/Bridge Street over Connecticut River

1889 Ten spans wrought iron lattice through truss. A landmark bridge, which is the oldest metal lattice through truss in Massachusetts. It is the only known truss bridge to have ten spans. Bridge was determined to be eligible for the National Register 1/9/79.

Lancaster L-2-4 Bolton Road over Nashua River

1870 Pinned and bolted wrought iron and cast iron Post's type pony truss. Very early and unique metal truss bridge with national significance entered in the National Register of Historic Places 9/10/79.

Lancaster L-2-8 Ponakin Road over Nashua River

1871 Post truss. This bridge is the only known surviving Post truss in the United States. This nationally significant bridge is located near a potential historic district.

Lowell L-15-8 Hale Street over B & M Railroad

1892 One span pin-connected wrought iron Pennsylvania through truss. Early example of an uncommon bridge type in Massachusetts. Only one of the five Pennsylvania trusses to be pin-connected, virtually unaltered. This bridge is also located near the South Common National Register Historic District.

LAN.919

MASSACHUSETTS ★ HISTORICAL ★ COMMISSION ★
★ A CommonWealth to Keep ★

March 6, 1991

Mr. Anthony J. Fusco
Division Administrator
Federal Highway Administration
Transportation Systems Center
55 Broadway - 10th Floor
Cambridge, MA 02142

ATTN: Mr. H. Pearlman

RE: Massachusetts Bridges, National Register Eligibility

Dear Mr. Fusco:

The Massachusetts Historical Commission has reviewed the historic bridge inventory forms prepared by the Massachusetts Department of Public Works. The Massachusetts Historical Commission concurs with the preliminary findings of Massachusetts Department of Public Works that the following bridges meet criteria for listing in the National Register of Historic Places.

<u>Bourne</u> (Bourne Bridge) B-17-4 State 28 over Cape Cod Canal

1934 Three span continuous truss with deck/through riveted steel truss, Warren type truss web. Central span is arched, and highway deck is suspended from its lower chords. Two single intersection Warren deck truss approach spans at each end of the main structure. A landmark, award winning bridge, known internationally for its design and setting.

<u>Bourne</u> (Sagamore Bridge) B-17-5 U.S. 6 over Cape Cod Canal

1935 Three span continuous truss. It is virtually identical to the Bourne Bridge, without the approach spans. The bridge won Honorable Mention in 1935 for its graceful design. Both bridges are elements in a much larger engineering project of significance in its own right, the Cape Cod Canal, a potential National Register Historic District.

Massachusetts Historical Commission, Judith B. McDonough, *Executive Director, State Historic Preservation Officer*
80 Boylston Street, Boston, Massachusetts 02116 (617) 727-8470

Office of the Secretary of State, Michael J. Connolly, *Secretary*

Lowell | L-15-19 | Bridge Street over Merrimack River

1937 Three span cantilever Warren type through truss. This visual landmark is a rare example of a major structural type in Massachusetts. Adjacent to the Locks and Canals Historic District (NR, NHL).

Lowell | L-15-21 | Textile Avenue over Northern Canal, Merrimack River

1896 Three span pinned steel Pratt deck truss. Oldest example of an uncommon highway bridge type in Massachusetts. It spans over the Northern Canal and Great River Wall of the Locks and Canals National Register Historic District.

Montague | M-28-18 | Bridge Street over B & M Railroad/ C.V. Railroad

1897 Latticed type through truss designed by Edge Moor Bridge Company of Delaware. It is the only known example of this unique bridge type..

Northfield | N-22-2 | East Northfield Road over Connecticut River

1901-1903 Three span steel Pennsylvania through truss. Unique variation of an uncommon bridge type. Gracefully designed bridge in an outstanding natural setting. The bridge is designed to function as a continuous truss under live loads and a simple truss with cantilevered ends under dead load.

Stockbridge | S-26-3 | Butler Road over Housatonic River

1881 Pin connected wrought iron half through Pratt pony truss with Borneman type stone pedestals rising above abutments. A rare and unique bridge design by a world famous bridge designer - George Morison. Bridge has national significance.

Waltham | W-4-9 | B & M Railroad over State Rte. 60, Linden Street

1894 Steel lattice through truss with quad web system. Intact example of an uncommon bridge type severely skewed. Reviewed and entered in the National Register of Historic Places 9/28/89.

Windsor | W-41-11 | Windsor Bush Road over Phelps Brook

1893 One span iron and steel Ball Queen post. One of only two surviving examples of Charles Ball unique pipe truss bridge.

The following bridge does not appear to meet National Register criteria at present. However, as this bridge reaches 50 years of age, its National Register eligibility should be reassessed.

LAN.919

Boston/Chelsea	B-16-17/C-9-6	United States Route 1 over Mystic River

1950 Three span cantilever Warren type web through truss. Double deck bridge is a Boston landmark.

Montgomery/Russell	M-30-8/R-13-18	I90 over U.S. Route 20, Westfield River

1957 Eight span, two continuous span riveted steel Pratt deck truss. A landmark bridge and the only Pratt deck truss to be designed with continuous deck truss spans.

The following bridges did not appear to meet National Register criteria for individual listing. However, the bridges are within, or adjacent to an historic district or potentially eligible historic district, and plans for replacement should take into consideration potential impact to adjacent properties.

Fitchburg	F-4-12	State Rte. 31/Rollstone Street over North Nashua River, Broad Street

This bridge is located adjacent to lower Rollstone Bridge (1870 Parker pony truss).

Greenfield/Montague	G-12-20/M-28-1	Montague City Road over Connecticut River

This bridge stands between East Greenfield and Montague city. Though inventory is incomplete, significant historic resources are in both areas. There is a group of turn of the century cottages on Montague City Road that may be eligible for listing in the National Register.

Lawrence	L-4-24	Salem Street over B & M Railroad

This bridge is adjacent to mill building and Victorian Gothic church; however, the level of information on this area is not well documented at this time.

The MHC concurs with the preliminary findings of MDPW that the following bridges do not appear to meet criteria for listing in the National Register of Historic Places.

Amesbury/Newburyport	A-7-16/N-11-17	I-95 over Merrimack River

Boston/Quincy	B-16-368/Q-1-50	Long Island Bridge over Quincy Bay	LAN.919
Conway	C-20-7	Hickory Ridge Road over South River	
Erving/Montague	E-10-5/M-28-5	Paper Mill Road over Millers River	
Montague	M-28-20	C.V.R.R. over North Leverett Road/ Sawmill River	
Northfield	N-22-26	B & M Railroad over Caldwell Road/ Connecticut River	
Westfield	W-25-4	United States Route 20 over Westfield River	

If you have any questions, please feel free to contact William Smith of this office.

Sincerely,

Judith B. McDonough

Judith B. McDonough
Executive Director
State Historic Preservation Officer
Massachusetts Historical Commission

JBM/WS/kab

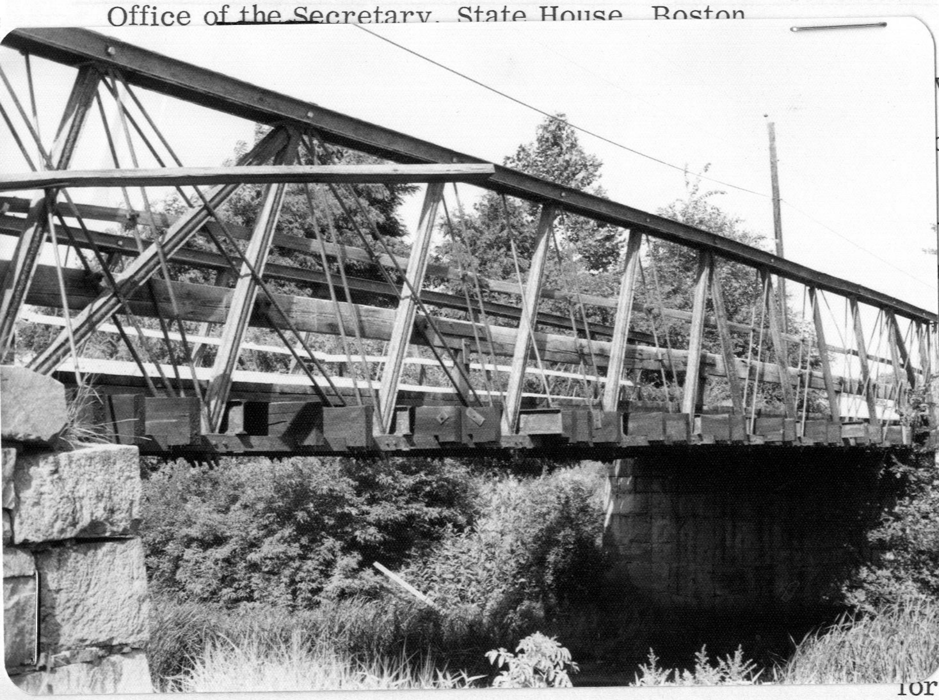
cc: Frank Bracaglia, MDPW

Pl. FIVE LAN.919 NR IND 9/10/79
USGS CLNT

FORM F - STRUCTURE

In Area no.	Form no.
	919

MASSACHUSETTS HISTORICAL COMMISSION
Office of the Secretary, State House, Boston



wn Lancaster

dress ~~Lower~~ Bolton Road

me Atherton Bridge

esent use Bridge

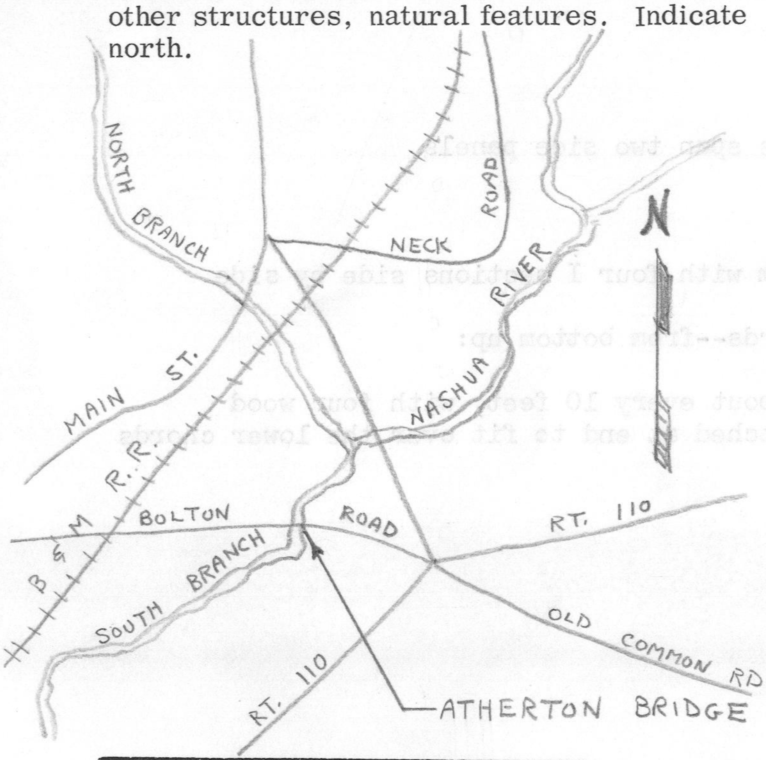
esent owner Town of Lancaster

pe of structure (check one)

dge	X	pound	
al		powder house	
n		street	
fort		tower	
gate		tunnel	
kiln		wall	
lighthouse		windmill	

other ____________

4. Map. Draw sketch of structure location in relation to nearest cross streets, buildings, other structures, natural features. Indicate north.



5. Description

Date 1870

Source Town Meeting Records
History of the Town of Lancaster,
by Abijah P. Marvin

Construction material Iron, wood

Dimensions 73ft long, 17.6ft wide

Setting Flat flood plain area

Condition Unused at present.

6. Recorded by Deborah J. Leonard

Organization Lancaster Historical Commission

Date December, 1977

DO NOT WRITE IN THIS SPACE	
USGS Quadrant	
MHC Photo no.	

(over)

5M-5-73-075074

LAN.919

7. Original owner (if known) Town of Lancaster

Original use Bridge

Subsequent uses (if any) and dates

8. Historical significance.

According to town records and maps, the first white man to come to the Nashaway Plantation, Thomas King, first entered Lancaster by means of an Indian trail which followed the present road over the east side of Wadaquodock Hill, which becomes Old Common Road to the Five Corners and along the Bolton Road to South Lancaster.

Former Chairman of the Lancaster Historical Commission Phyllis A. Farnsworth writes: "This continued to be the Main Road into Lancaster for many years, and Lancaster's earliest bridge was built where the present Atherton Bridge is located. It is named for the family of James Atherton, who was one of the signers of the petition for Incorporation of Lancaster in 1653. Bridges were then called by the names of families who lived nearby."

At the March, 1870 Town Meeting, a committee of five was appointed to "consider" the rebuilding of the Atherton Bridge. A sum of $4,000.00 was raised and appropriated for the building of the first iron bridge in Lancaster. The bridge was built that year.

Mechanical Engineer Lee P. Farnsworth has generally described the structure as follows:

1. Dual tension rod vertical and posts
2. Dual riveted I section inclined hips, meeting at inverted "V" at center
3. Tension rod diagonal side bracing:
   a) the first, across one side panel
   b) the second and remaining diagonals span two side panels
4. Open top
5. Top chords are a riveted compound beam with four I sections side by side
6. Floor is suspended from the lower chords--from bottom up:
   a) riveted eye section cross beams about every 10 feet, with four wood cross beams spaced between and notched at end to fit over the lower chords
   b) longitudinal planking
   c) cross planking deck

9. Bibliography and/or references such as local histories, deeds, assessor's records, early maps, etc.

Early town maps

Town Meeting records

History of the Town of Lancaster, Rev. Abijah P. Marvin.

August 1977 LAN.919

ATHERTON BRIDGE THREATENED
by Phyllis Farnsworth

Lancaster's first iron bridge, the Atherton Bridge, which crosses over the Nashua River on Bolton Road, has been closed to car and truck traffic. Some time in the future a decision will be made on the fate of this historic landmark.

In 1643, when Thomas King became the first white man to come to the Nashaway territory, he traveled into Lancaster over an Indian trail which followed the present road over the east side of Wataquadock Hill, which becomes Old Common Road to the Five Corners, and along the Bolton Road to South Lancaster.

This continued to be the Main Road into Lancaster for many years, and Lancaster's earliest bridge was built where the present Atherton Bridge is located. It is named for the family of James Atherton, who was one of the signers of the petition for incorporation of Lancaster in 1653. Bridges were then called by the names of families who lived nearby.

Hard winters and spring floods often took away the early wooden bridges, and many replacements at this crossing were again named Atherton Bridge. In 1870, Lancaster's first iron bridge was erected, and it is this Atherton Bridge which remains today.

Generally described by Mechanical Engineer Lee P. Farnsworth, it is as follows:

1. Dual tension rod vertical end posts
2. Dual riveted I section inclined hips, meeting at inverted "V" at the center
3. Tension rod diagonal side bracing:

a) the first, across one side panel

b) the second and remaining diagonals span two side panels

4. Open top
5. Top chords are a riveted compound beam with 4 I sections side by side
6. Floor is suspended from the lower chords--from bottom up:

a) riveted I section cross beams about every 10 feet, with 4 wood cross beams spaced between and notched at end to fit over the lower chords

b) longitudinal planking

c) cross planking deck

Bridges once crucial in American life are often in these times being replaced with little thought that they are vital parts of our historic development. Fortunately, many people do realize the importance of historic preservation and do not wish to see all reminders of our past erased from the landscape.

Technical Leaflet No. 95, published by the American Association for State and Local History, on Bridge Truss Types: A Guide to Dating and Identifying, states that many of these early iron bridges are unfortunately demolished with little concern for repair. "However, some progressive communities are learning that repair costs can often be lower than the cost of building a new bridge. Only after communities recognize the significance of these older bridges within America's contemporary landscape will some be retained as working, useful reminders of our nation's historical development."

Today in Lancaster there must be some people who would wish to see the old bridge go so that once again there can be a straight, fast way from the Five Corners to South Lancaster with the commencement again of heavy truck traffic onto Bolton Road.

There must also be some people who live on Bolton Road who would now prefer the peace of a dead end street and the inconvenience of traveling a little further to the constant noise and danger of the traffic. Not everyone believes that faster is better.

There are many people in Lancaster who believe that maintaining its historical assets will be an economic advantage to the town.

It would appear at this point that the following could happen:

1. Leave the bridge as it is, and take the longer routes between Five Corners and South Lancaster.
2. Make a new bridge in another place and leave the old bridge.
3. Destroy the Historic Landmark and replace it with a new one.
4. Move the bridge to another place to be used as a footbridge, bicycle, bridle, or snowmobile crossing.

If local control is to be had over the bridge, and people do appreciate the value of keeping their historical assets, the people should speak out and make themselves heard by writing or in some other way getting in touch with their Selectmen.

Photo: Steven J. Schwartz, 1989

Photo: Steven J. Schwartz, 1989

Atherton Bridge
Spanning Nashua River on Bolton Road
Lancaster Vicinity, Massachusetts
Worchester County

HAER No. MA-17

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

Historic American Engineering Record
National Park Service
Department of the Interior
Washington, D.C. 20240

HISTORIC AMERICAN ENGINEERING RECORD

ATHERTON BRIDGE

DATE: 1870

LOCATION: Spanning Nashua River on Bolton Road
Lancaster Vicinity, Massachusetts

BUILT BY: Unknown

OWNER: Town of Lancaster

SIGNIFICANCE: The Atherton Bridge is as example of a hybrid pony-truss that bears a similarity to the Post truss. The bridge is 72 feet long, 18 1/2 feet wide, and is comprised of eight panels. It rests on granite abutments and was, at the time of its construction, the only iron bridge in Lancaster. Characteristics of the Post truss incorporated into the Atherton Bridge include compression members which incline towards the middle of the bridge, and tension rods which incline outwards. These tension rods and compression members extend over one panel except at the ends, where they extend over two. The compression members are formed of "Phoenix Columns," patented by the Phoenix Iron Company of Pennsylvania. The top chord consists of rivited compression members. The web members are joined to the top chord by pin connections while the web connections are joined to the bottom chord with screw connections. The bridge's wood and steel floor beams rest directly on the bottom chords of the truss. The floor beams support a wood plank deck. This structure retains an enormous amount of historical integrity. It is listed on the National Register of Historic Places.

RESEARCH AND TRANSMITTAL BY: Donald C. Jackson, Engineer, and
Monica E. Hawley, Historian, 1983

Addendum to
Atherton Bridge (Bolton Road Bridge)
Spanning the Nashua River on Bolton Road
Lancaster
Worcester County
Massachusetts

HAER No. MA-17

PHOTOGRAPHS
REDUCED COPIES OF MEASURED DRAWINGS
WRITTEN HISTORICAL AND DESCRIPTIVE DATA

Historic American Engineering Record
National Park Service
Department of the Interior
Washington, DC 20013-7127

HISTORIC AMERICAN ENGINEERING RECORD

ATHERTON BRIDGE
(BOLTON ROAD BRIDGE)
HAER No. MA-17

Location: Spanning the Nashua River on Bolton Road, Lancaster, Worcester County, Massachusetts
UTM: Hudson, Mass., Quad. 19/280210/4702400

Date of Construction: 1870

Structural Type: Wrought- and cast-iron Post-type pony truss bridge

Fabricator/ Builder: J.H. Cofrode & Company, Philadelphia

Engineer: Unknown; truss configuration similar to bridges designed by Simeon S. Post

Owner: Town of Lancaster, Massachusetts

Previous Use: Rural vehicular and pedestrian bridge

Present Use: Closed to vehicular traffic, 1975

Significance: The Atherton Bridge is an unique variation on the metal truss designed by Simeon S. Post in the 1860s, and one of only a small number of Post-type bridges known to survive nationally. The Post truss enjoyed a brief period of popularity in the late 1860s and early 1870s and was used widely by railways for long-span river crossings. The Atherton Bridge is unique in that the web configuration resembles a Post truss, but the bridge does not incorporate Post's patented joints. The builders of the bridge, J.H. Cofrode & Company of Philadelphia, probably adapted the Post form for use in small highway bridges. The Atherton Bridge is locally significant as the first iron bridge erected in Lancaster. Although it has sustained structural damage from overloading, the bridge has not been significantly altered.

Project Information: Documentation of the Atherton Bridge is part of the Massachusetts Historic Bridge Recording Project, conducted during the summer of 1990 under the co-sponsorship of HABS/HAER and the Massachusetts Department of Public Works, in cooperation with the Massachusetts Historical Commission.

Patrick Harshbarger, HAER Historian, August 1990

Introduction

The Post truss, although never as prevalent as its nineteenth-century counterparts--the Howe, Warren and Pratt trusses--nonetheless played a definitive role in the development of American bridge building. Designed by Civil Engineer Simeon S. Post (1805-1872), the truss enjoyed a brief period of popularity in the late 1860s and early 1870s, primarily for long-span railroad bridges. Post never patented the web configuration of the truss, but in 1863 he received a patent for the joint connections. Engineers considered Post's design ideal because of its apparent stiffness and economy of material. Nevertheless, a number of factors, including heavier load requirements, led to the obsolescence of the Post truss by the century's last decade.[1]

The Atherton Bridge, 1870, and the Ponakin Bridge, 1871 (HAER No. MA-13), both located in Lancaster, Massachusetts, are two of only a small number of surviving examples of Post-type trusses in the United States.[2] Unlike the majority of Post trusses built in the nineteenth century, the Atherton and Ponakin Bridges are short-span highway bridges, rather than long-span railroad bridges. The two bridges, excellent examples of this now-rare truss type, owe their survival to their location on less-traveled byways of the nineteenth century. Both bridges are listed on the National Register of Historic Places.

Although somewhat similar in form, the Atherton and Ponakin Bridges differ with regard to their incorporation of features of the Post patent. The Ponakin Bridge, built by the Watson Manufacturing Company of Paterson, New Jersey, incorporates all of the features of Post's design. The Atherton Bridge, built by J.H. Cofrode & Company of Philadelphia, adapts the Post-truss configuration to a smaller highway bridge, but does not make use of the specific features of Post's patent.[3](See Figure 1.) For more information on the Ponakin Bridge, refer to HAER No. MA-13.

Description

The Atherton Bridge spans the Nashua River on Bolton Road about three-quarters of a mile south of Lancaster Center. The bridge sits in a low-lying flood plain near the confluence of the North Nashua and Nashua Rivers. A residential neighborhood and an adjacent cornfield lie to the west of the bridge, and the town garage is located to the east. Scrub trees line the river banks. The bridge has been closed to vehicular traffic since 1975, and the road is blocked with concrete barriers, but the bridge is still used by pedestrians and bicyclists.

The Atherton Bridge is a single-span pony truss, measuring 75'-5¼" long, 19'-1" wide, and 8'-0" high. The upper chord is comprised of two wrought-iron, C-shaped beams, joined across the top by a riveted reinforcing plate. The lower chord varies across the length of the bridge. From the footing to the second joint, the lower chord consists of two 4"x½" wrought-iron bars. From the second joint to the middle of the bridge, the lower chord consists of four of these bars. The chord bars are of various lengths and joined together by riveted plates at staggered intervals. The upper and lower chords are joined by posts and diagonals, whose web pattern mimics a Post truss. The posts incline at approximately 22½ degrees towards the center of the bridge, and the diagonals at 22½ degrees towards the abutments. The inclined posts are hollow, 4"-diameter, riveted wrought-iron Phoenix-type columns, manufactured by the Phoenix Iron Works of Philadelphia. The diagonals are 1"-diameter wrought-iron rods. At either end of each truss are two posts anomalous to the classic Post-truss design. One of these Phoenix-column posts runs from the footing to the first joint in the upper chord, and the other from the footing to the second joint.

Another distinguishing feature of the Atherton Bridge is the lack of counters, and single (rather than double-intersecting) diagonals. Of further interest are the diagonals which run through the centers of the two hollow Phoenix-type columns at the center of the span.

The endposts consist of two hollow cast-iron tubes and an adjustable tension rod that fit into cast-iron joint boxes at the lower and upper chords. Sockets in the lower castings also hold the two anomalous Phoenix-type columns. The upper and lower chords attach to the end-post joints by bolts.

The other lower-chord connections have cast-iron joint boxes with bolts threaded onto the ends of the diagonals. The upper chord joint boxes are similar, except that the diagonals are held by pins. The Phoenix-type columns fit into sockets in the castings and are held in place by metal sleeves.

Wrought-iron, I-shaped floor beams rest directly on the lower-chord bars near the joints. Pairs of timber floor beams have been placed between the iron floor beams. Wooden plank decking runs the length of the bridge. Four wrought-iron outriggers, two on either side of the bridge, riveted to the inside of the upper chord and are bolted to the top of the iron floor beams about 21' from either end of the trusses. They are intended to improve the lateral stability of the pony truss.

The Atherton Bridge has not been significantly altered, although it has suffered from major structural damage. The northeast endpost has been forceably removed and many of the Phoenix-type columns have been dislocated from their sockets. One column has been replaced by a simple iron pipe. A number of the diagonals are bent and twisted, and the lower chord has slid from its channel in the northeast footing. The Atherton Bridge does not have a builder's plate.(See HAER drawings and photos.)

<u>Simeon S. Post and the Post-Truss Patent</u>

During the nineteenth century, bridge building evolved from an art to a science; a craft once practiced by local carpenters and millwrights became a business organized by engineers and industrialists. Iron and steel replaced wood as the engineer's material of choice, and monumental bridges spanned rivers at one time thought impassable.

The career of Simeon S. Post reflected this transformation. Born in New Hampshire in 1805, Post did not receive an education in engineering, but rather, learned the trade of a house-joiner. The facts of Post's early life are sketchy, but sometime after completing his apprenticeship he moved to Montpelier, Vermont, to begin his career. While there, he made the acquaintance of the state's Surveyor General, John Johnson, and became involved with surveying for the new state capitol. Johnson, perhaps as a political favor, arranged to have his son, Edwin Johnson, the chief engineer of the newly-formed Auburn & Syracuse Railroad, appoint Post to a resident engineer's position on the railway.[4]

The fledgling railroad industry provided one of the greatest training grounds for civil engineers. A survey of the first fifty-five members of the American Society of Civil Engineers (ASCE), the oldest professional engineering organization in the United States, found that thirty had worked for the railroads and that fully 60 percent had not attended an engineering school. Like Post, they gained their education from the practical experiences of surveying railways, digging tunnels, and erecting bridges.[5]

Although the railroads provided opportunities for ambitious young men, the early history of railroad-bridge engineering was frequently marked by trial-and-error methods, inadequate knowledge of the strength of building materials, and irresponsible construction practices. The railroads required bridges stronger and more durable than the traditional wooden ones built by American craftsmen. Iron offered a solution to the railroads' bridge problem but manufacturing technology limited the size, width and strength of truss members. Engineers poorly understood the factors that determined the maximum load and structural action of iron trusses; consequently, they met with limited successes, and some disastrous failures.[6]

Post was in an ideal position to observe and participate in the development of iron bridge-building technology. In 1840 he became the New York & Erie Railroad's resident engineer, a position that was to bring him in contact with Squire Whipple, one of the most highly-regarded American bridge builders of his day, who also worked for the railroad company. Whipple patented two iron trusses, one in 1841 and the other in 1846, both of which became important models for later bridges. Whipple was also foremost among his American contemporaries in understanding the nature of truss action. His book, A Work on Bridge Building (1847), was the first scientific treatise to accurately describe the way loads distribute themselves through the joints and the separate members of a truss. In the late 1840s, the New York & Erie built a number of Whipple trusses. By that time Post had climbed to the position of Superintendent of Transportation, and may have had some oversight responsibilities for the bridges' construction.[7]

If Post had the good fortune to associate with America's foremost bridge engineer, he also had the bad fortune to experience iron bridge disasters first hand. In 1849 and 1850, the New York & Erie contracted with Nathaniel Rider, a bridge-builder from New York City, to erect several trusses along its lines. Two of the bridges failed, and public outcry convinced officials of the New York & Erie Railroad to suspend the building of new iron bridges and to tear down all of the railroad's existing iron trusses, including those designed by Whipple. Fifteen years passed before the New York & Erie built another iron bridge.[8]

Despite the railroad's bridge problems, Post's career began to earn him the respect and admiration of his peers. Post worked with Ezra Cornell to introduce the earliest-known system of telegraphy to monitor the movement of trains and to prevent collisions. He also invented a parabolic headlight reflector used by locomotives, a system of railroad baggage checks, and a design for railroad timetables widely adopted by other railroad companies. In 1851, after eleven years of employment with the company, the New York & Erie

Railroad promoted Post to the position of Chief Engineer.[9]

As his career unfolded, Post took some interest in the development of engineering as a profession. In 1852 Post accepted an invitation to join with eleven other engineers as a founding member of the American Society of Civil Engineers (ASCE) in New York City. The early history of this organization was full of disappointment; meetings were underattended, and one of the association's officers lost the organization's money in a doubtful investment scheme. The organization became viable only after the Civil War. Shortly after gaining his charter membership, Post left the East Coast for a new position with the Ohio & Mississippi Railroad; henceforth, he appeared to take only a passing interest in the ASCE's activities.[10]

In 1855 Post returned to the New York & Erie Railroad as a consulting engineer and received charge of the construction of New York's Bergen Tunnel. Three years later, as the project neared completion, funds ran short and Post found himself without a job. Consequently, he set up his own independent civil engineering practice in New York City, and turned his attention to the problems of bridge construction.

Few engineers could have been better prepared to consider the needs of American bridge builders. In 1859, Post published his "Treatise on the Principles of Civil Engineering as Applied to the Construction of Wooden Bridges." The treatise appeared in weekly installments in American Railroad Journal, and was clearly aimed at an audience of railway men uninitiated to calculating loads and strains. Beginning with an explanation of Newtonian forces, and ending with numerous examples of how to determine the correct size and length of wooden truss members, Post demonstrated a clear understanding of Whipple's principles of truss building.(See Appendix A.) Post's decision to apply this knowledge to wooden bridges probably reflected the simple and overwhelming fact that most American railroads still preferred to build out of the less-costly material.[11]

Still, Post understood that the future of American bridge-building lay in the construction of strong and durable iron trusses. Beginning in the 1860s, many engineers formerly employed by the railroads came to the same conclusion. They struck out on their own into the potentially profitable business of contract iron-bridge building. These entrepreneurs associated themselves with existing firms or organized new companies, often making a specialty of a certain type of truss, sometimes controlled by a patent or license.[12]

In June 1863, Post obtained letters of patent for an improvement in iron bridge joints.(See Appendix B.) He claimed that his method of construction allowed the struts and braces to revolve upon a bolt to the degree that the bridge expanded and contracted from changing load conditions and variations in temperature. Post's patented joints consisted of a joint box and pin that connected segments of the top chord and received the heads of the posts, struts and braces; a cylindrical joint that held the rounded end post; and a slotted chord used in combination with the cylindrical joint. Bridge engineers considered increasing the rigidity of iron trusses while maintaining enough flexibility to keep them from buckling a fundamental problem, and Post attempted to address this concern.[13]

Two years after receiving his patent, Post contracted with his old employer, the New York & Erie Railroad, to build the first bridge based upon his improved design. Post's truss at Washingtonville, New York, was also probably the first iron bridge erected by the railroad since the disasters in 1850. This bridge made use of Post's patented joints and had the distinctive arrangement of inclined posts and diagonals found in his later trusses.

During the next five years, Post devoted his time to the construction of his bridges. Unfortunately, the record of these years is vague, and Post's attempts to turn a profit through licensing agreements, partnerships and other business dealings can only be surmised. Apparently, either because of old age, disinterest, or lack of financial resources, Post made no attempt to start his own bridge-building firm, but licensed his patent to the Watson Manufacturing Company of Paterson, New Jersey, of which his son, Andrew Post, was a managing partner. In 1867 the Illinois & St. Louis Bridge Company, which probably also held license to build the patented trusses, listed Post as a consulting engineer.[14] Whether or not Post had relationships with other bridge manufacturers is unknown. It is also unclear what involvement Post had with the construction and engineering of specific bridges.

In March 1870, at the age of 65, Post accepted a position as Engineer of Construction for the Northern Pacific Railroad. Four months later, he was stricken by paralysis, probably from a stroke, and his professional career came to an abrupt end. Post died in Jersey City, New Jersey, on June 29, 1872.[15]

The Post Truss in the United States

The Post truss enjoyed a brief, but vigorous, period of popularity in the late 1860s and early 1870s. In 1868 Post's design received national recognition when the Union Pacific Railroad decided to use it for the largest river crossing on its line, spanning the Missouri River between Council Bluffs, Iowa, and Omaha, Nebraska. The Union Pacific's choice was surprising, considering the untested nature of the bridge, but Post's truss claimed greater rigidity under moving loads, and this appealed to the railroads. The Illinois & St. Louis Bridge Company completed this extraordinary bridge in 1872.(See Figure 2.) Including the approaches, it was a little over two-and-a-half miles long, with eleven cast- and wrought-iron Post truss spans measuring 250' each.[16]

Not to be outdone by the Union Pacific, other railroads expanding into the west also chose Post trusses for their crossings of the Missouri River. In 1869, the Chicago, Burlington & Quincy Railroad began building a five-span bridge, measuring approximately 1,000' long, at Kansas City, and shortly thereafter, another of nearly the same length at Leavenworth, Kansas. The Post truss reached its maximum length in the Missouri River Bridge of the Missouri, Kansas & Texas Railroad, at Booneville, Missouri, in 1874. This bridge had a swing span 360' long. At least for a short while, the enthusiasm that followed in the wake of the transcontinental railroads secured the popular reputation of the Post truss as a viable option for longer bridge spans.[17]

The Post truss belonged to a family of trusses that could be distinguished by posts or verticals in compression, and diagonals in tension.

Throughout the mid-nineteenth century countless engineers and bridge-manufacturers built variations on this design, the most common of which was the Pratt truss, but to which the less-common Parker, Camelback, Lenticular, Baltimore, Pennsylvania, Kellog, Whipple and Post trusses were all related. This impressive list of truss types was the result of experimentation by engineers, and of keen competition among firms searching for advantages against their rivals. Engineering journals constantly featured articles comparing the merits of one truss against another. The Post truss's distinction as a long-span bridge was an important factor in this debate.[18]

Not surprisingly, bridge builders found the most attractive feature of the Post truss to be the unusual pattern of inclined posts and verticals, and not the special joints, which Post had thought important enough to patent. Post's patented joints could not be copied except under license from the engineer or his assignees, but the distinctive diagonals and posts held no such restrictions. In 1870 Col. William E. Merrill, an engineering graduate of the United States Military Academy, published a book that claimed that the Post-truss type conformed with his theoretical determinations of the most economical angles for bridge members. He argued that given trusses of equal length, depth, width and strength, the Post truss would contain less metal than other trusses, at a minor, although perhaps not insignificant, cost advantage to its manufacturer.[19] Although Merrill's calculations were somewhat misleading, because many other factors influenced bridge costs, his assertions created a stir in the engineering community.

Whether Merrill had anything to gain by promoting the Post truss over the other types is unknown, but his assertions touched off a fierce debate with Squire Whipple, the dean of American bridge builders. In a paper read before the ASCE in 1872, Whipple, in a scathing tone untypical for engineering journals, told the society's members that Merrill had misrepresented the Whipple Truss and made it appear vastly inferior to the Post Truss. In fact, Whipple concluded, the Post truss was merely a modification of the Whipple truss, "first used and thoroughly discussed" by himself.[20]

Simeon Post lay dying, and could not answer either Merrill's or Whipple's assertions. Post may have inclined the truss posts for economic reasons, but no historical records have been found to say that Post might not have also felt that his modifications strengthened the truss or offered a technical advantage in the manufacturing process. Whipple directed his attack solely at Merrill, so there was also no reason to believe that Post had fallen out with the well-regarded engineer.[21]

Persuaded by the economy of the Post-truss form, any number of bridge builders may have designed variations on it. The Atherton Bridge, for example, appears to be an adaptation of the Post truss to a small highway bridge. The Bell's Ford Bridge in Seymour, Indiana, is a composite bridge with wooden posts and iron diagonals. Other Post trusses no longer surviving, but identified from historic photographs, include bridges in Paterson, New Jersey; Pittston, Pennsylvania; Columbiaville, New York; and Clear Creek Canyon, Colorado. How many of these bridges were built by the Watson Manufacturing Company, and other licensees of the Post Patent is unknown.[22]

The popularity of the Post truss ended almost as quickly as it began. By 1880, bridge companies had stopped building Post trusses. The last two decades of the nineteenth century saw an increasing uniformity and standardization of truss form, as competition weeded out those trusses that did not demonstrate versatility, durability, and economic desirability. In 1876, the Watson Manufacturing Company erected three Post trusses in Brazil and then went into receivership and out of business. Heavy locomotives and railroad cars simply wore out the cast and wrought-iron, pin-connected bridges. The Union Pacific Railroad replaced its Post-truss Missouri River bridge in 1886, and the other Post-trusses across the Missouri disappeared by the turn of the twentieth century.

The railroads demolished or abandoned the Post trusses at an astonishing rate. Cantilever bridges replaced trusses in long-span crossings, and Pratt and Warren trusses became the engineers' choice for shorter spans. J.A.L. Waddell, an authority on nineteenth and early-twentieth century bridge engineering, remembered being called upon in 1888 to rebuild a large Post truss which had caught fire. He wrote that, "It was a very difficult piece of work to patch up the detailing so as to make it safe and passable; and it was absolutely impossible to make the bridge anything like a first-class structure, even for the light live load it had to carry." Those Post trusses that incorporated the patented joints proved even more difficult to maintain; the cast-iron boxes that encased the joints prevented inspection and repair of pins and bridge members.[23]

By the first decades of the twentieth century, even inclined posts and diagonals, once the Post truss's strongest feature, became a weak point in light of advances in the theoretical understanding of structural engineering. The odd angles made it difficult to determine whether compressive or tensile forces would be placed on certain bridge members as live loads passed over the truss. In 1927 George Fillmore Swain, one of the nation's foremost structural engineers and a professor at Harvard University, wrote the engineering professions' final words on the Post truss: "There is nothing to recommend this truss that cannot be obtained in a better and more economical way." Forgotten, ignored and disdained, the Post trusses disappeared from the landscape.[24]

Lancaster's Early Bridges

The town of Lancaster lies in the rolling hills of the Worcester Plateau in Central Massachusetts, at the confluence of the Nashua and North Nashua Rivers. Founded in 1653, Lancaster became an important early market center and a gateway to the western frontier of New England. By 1771 Lancaster was the region's wealthiest agricultural and commercial town. The fertile fields of the Nashua intervale contributed to the town's prosperity, as did the development of a number of industries, including saw and grist milling, potash making, tanning, slate quarrying, and ceramics manufacturing. As the town's citizens entered the nineteenth century, overland transportation increased in importance. Shortly after the turn-of-the-century, the state chartered the Lancaster-Bolton Turnpike (1806) and the Union Turnpike (1808), as part of an interregional network of east-west roads radiating from Boston and passing through the town of Lancaster.[25]

Local farmers and millwrights built the town's early bridges, which were usually nothing more than wooden trestles with log abutments. Floods regularly washed away one or more of Lancaster's seven or eight bridges, and the citizens attempted to replace them with a minimum of fuss and expense, although the costs occasionally proved burdensome. In the late-eighteenth century, the town issued lottery tickets in an attempt to raise money for the general repair and rebuilding of the bridges.[26]

New England's tradition of local government gave the town meeting and the elected officials (selectmen) authority over the erection of new bridges. Beginning in the early-nineteenth century, Lancaster's town records show a continuing concern for bridge improvements. In 1801 a town committee recommended building stone arch bridges, but this suggestion does not appear to have been adopted. The town treasurers kept careful expense records, and rarely did a year pass when the town did not pay for some bridge repairs or upkeep.[27]

Bridges had crossed the Nashua River at the site of the Atherton Bridge since the late-seventeenth or early-eighteenth century. The early settlers named the Atherton Bridge after James Atherton, one of the incorporators of the town. The nearby Lancaster-Bolton Turnpike bypassed the Atherton Bridge, crossing the Nashua River about 1,000' to the north, at Center Bridge.

Town reports first mention the Atherton Bridge in 1810, when a repair of $8.45 was recorded. Usually, small payments went to replacing worn-out planks and timbers, or sometimes to "snowing," which meant shoveling and packing snow onto the bridge roadway for sleds to pass during the winter.

In 1826, a flood washed away the Atherton Bridge, and at the town meeting the citizens decided to follow up on recent suggestions to build more substantial bridges. The builders of the new bridge adopted a wooden arch plan designed by Farnham Plummer, a local resident. This bridge appears to have been a variant upon the wooden arch bridges common at that time.[28]

In 1830, the Atherton Bridge floated down river once again. This time the rebuilders chose to erect a new structure based upon the design of Ithiel Town. Patented in 1820, this wooden truss employed closely-spaced diagonal timbers in a lattice pattern, to create a stiff web of considerable strength. New England towns favored the Town lattice truss for covered bridges because it was strong, and local millwrights had the skill necessary to pin together the trusses on the riverbanks and then slide the bridge across the river and into place. Ithiel Town rarely built the trusses, but advertised his plans and collected royalties from the towns that decided to use his idea. The Town lattice truss survived forty years at the Atherton Bridge crossing, although it occasionally needed substantial repairs, probably the result of flood damage.[29]

As the nineteenth century progressed, the town of Lancaster ceased to be a major commercial center for the region. Industrialization brought textile mills to the area. The Lancaster Mills Company had been organized in the 1820s, and the town of Clinton, comprised of Irish workers' communities, separated from Lancaster in 1850. Clinton, Fitchburg and Leominster emerged as new centers of commerce. Lancaster maintained its agricultural economy -- based on supplying the Boston market with livestock, dairy products, corn, hops, potatoes and hay--and experienced some growth in the industrial areas, primarily cotton spinning, expanding from a annual production rate in 1845 of

135,000 yards to a rate in 1865 of 500,000 yards.

Following the Civil War, Lancaster--a short day's train ride from Boston--also became a popular summer residence for wealthy merchants and industrialists.[30] One of the most prominent of these prosperous summer tenants was Nathaniel Thayer, a Boston financier and philanthropist with roots in Lancaster. In 1870, Thayer (age 62), claimed permanent residence in Lancaster as a means of escaping Boston's high tax rates. The town of Lancaster suddenly received a tax windfall of over $12,000 on Thayer's estimated $1.2 million; this exceeded twenty-five times the amount paid by any other single citizen in town. Lancaster's property owners rejoiced because the tax rates could be easily kept at a relatively modest one percent, and new public improvements could be undertaken with the expanded tax pool.[31]

In the spring of 1870, Lancaster's citizens gathered at the town meeting to decide what to do with their new-found tax dollars. J.S.L. Thompson, the town clerk, recorded that a proposal to replace the wooden bridges with iron and to improve the principal roads received a favorable hearing. The first bridge on the town's agenda was the Atherton Bridge, and the town appointed a bridge committee of five members to look into the cost of buying a new iron truss for that location. Charles L. Wilder, a local merchant and cotton manufacturer, chaired the committee.

The bridge committee announced its intention to let a bridge contract in the local newspaper, and directly contacted the local agents of bridge manufacturers for proposals. They also took care to visit iron bridges in nearby towns and to compare the cost of an iron bridge with a wooden one, an indication that some of the committee members may have still been skeptical about the reliability of iron trusses.

Sometime in the spring or summer of 1870, the committee reported that a wooden bridge would cost only $100 or $200 less than an iron one. Electing for an iron truss, they stated that they could recommend three bridge builders: A.D. Briggs Company of Springfield, Massachusetts; J.H. Cofrode & Company of Philadelphia; and the Mosely Iron Bridge Company of Boston. The committee specified that the bridge would be:

> built above the abutments of wrought iron, except the head and foot blocks or washers, which are of cast iron, complete ready for travel, and to have two coats of good metalic paint [sic]. And are warrented to sustain a weight of two thousand lbs [per linear] foot, and that will not be more than one fourth to one sixth of the weight required to break it [sic].

The committee's report did not state how the town officials chose between the truss manufacturers, but they finally awarded the contract to J.H. Cofrode & Company, for $29.50 per linear foot.[32]

J.H. Cofrode & Company

Little information could be found about J.H. Cofrode & Company. Victor Darnell's Directory of American Bridge Builders, 1840-1900 (1984) listed the first known activity of the company in the year 1870, the same year as the erection of the Atherton Bridge. A search of the 1871 Philadelphia City Directory turned up a listing for "Joseph H. Cofrode, John H. Schaeffer and Francis A. Saylor, engineers and bridge builders." Although the partnership of J.H. Cofrode & Company probably did not survive the early 1870s, Cofrode and Saylor listed themselves as the proprietors of the Philadelphia Bridge Works between 1877 and ca.1890.

The Atherton Bridge, an unique variation of the Post truss, may have been an experimental design by J.H. Cofrode & Co. Built at the height of the Post truss's popularity, the Atherton Bridge could have been inspired by Merrill's arguments about the economic angle of the posts and verticals. The Phoenix columns were a patented commercial item, available exclusively from the Phoenix Iron Works of Philadelphia, holders of the patent.

Construction of the Atherton Bridge

In the fall of 1870, the Atherton Bridge's unassembled iron members arrived by rail from Philadelphia. As was typical of nineteenth-century bridge contracts, the manufacturer of the iron truss took responsibility for erecting the superstructure of the bridge, while the town hired a local contractor to prepare the abutments and piers, and lay the floor timbers. Local men provided the oxen to haul the stone from the railroad depot to the site, and many millwrights and masons who might have lent their expertise to earlier bridges continued to help with various phases of the construction.[33]

By late October or early November, the bridge builder had completed the new iron truss. As a final precaution, the bridge committee hired Joshua Thissle, an engineer from the nearby Lancaster Mills cotton factories, to test the Atherton Bridge's structural safety. Before a crowd of spectators, including representatives of J.H. Cofrode & Company, Thissle drove wagon teams loaded with 25,730 pounds of stone onto the truss. To everyone's satisfaction, the deflection measured only four-hundredths of a foot, less than than ½".[34]

In the spring of 1871, Lancaster's citizens gathered once again at the annual town meeting. They reviewed the finances, elected new officials, and discussed needed public improvements. The town clerk wrote in his personal journal that, "the town was so well pleased with the new bridge [Atherton Bridge], that they voted to rebuild with iron, two bridges, vis. the Centre and Ponakin, at an expense of about $6000 each [sic]." The citizens of Lancaster had quickly shown pride in their new iron bridge, and willingly spent Thayer's tax dollars to upgrade their other bridges.[35]

During the summer, the Watson Manufacturing Company of Paterson, New Jersey erected two Post patent trusses, one at the site of the Center Bridge, and one at the site of the Ponakin Bridge (HAER No. MA-13).

Preservation of Lancaster's Post-Truss Bridges

Although the Ponakin and Atherton Bridges show signs of age and deterioration, they have been altered only slightly since their erection in 1871 and 1870. Town records show that approximately every ten years, and sometimes more or less frequently, workmen replaced the wood deck and stringers or performed some minor maintenance on the trusses, such as painting the iron work.

The greatest threat to the iron trusses has always been obsolescence. As early as 1910, Lancaster's road commissioners advocated replacing the town's iron bridges with wider concrete-arch highway bridges for safety and durability. Fast-moving automobiles could not pass the narrow bridges safely, and heavily-loaded trucks and buses placed stresses on the trusses that the builders rarely had designed them to carry. Over the decades, Lancaster's iron bridges slowly disappeared, casualties of metal fatigue, unsafe conditions or floods. The Atherton and Ponakin Bridges survived simply because the closing of the mills and the completion of the state highways relegated them to less-traveled backroads.[36]

Nonetheless, in the 1970s heavy traffic finally took its toll. In 1973 the town requested funds from the state to replace the Atherton Bridge, and shortly thereafter closed the bridge to vehicular and pedestrian traffic. This aroused minor complaints of inconvenience from local residents, but eventually they found other ways around the river crossing.

In 1977 the Massachusetts Department of Public Works (MDPW) signed contracts to replace the bridge, but the request met with some local resistance. Some favored a new bridge, but others had grown to like the quiet dead end street created by the bridge barriers. The historical significance of the Atherton Bridge was only dimly understood by most members of the community. In the meantime, the engineers had also closed the Ponakin Bridge, adding it to the threatened structures list.

Fortunately for the bridges, Lancaster had an active preservation movement. The town center included a beautifully restored Bullfinch meeting house, a town green, neoclassical library, and numerous examples of eighteenth- and nineteenth-century domestic architecture. A group of citizens led by Bill Farnsworth, a town selectmen, and Phyllis Farnsworth, chairperson of the Lancaster Historical Commission (LHC), wondered if the bridges could be saved. Phyllis Farnsworth wrote an article for the paper pointing out that the Atherton Bridge was Lancaster's first iron truss.[37]

The LHC became aware of the bridges' national significance when an inquiry to the Historic American Engineering Record brought a letter from Douglass L. Griffin, HAER Historian, who wrote back that "Taken together, the [Atherton and Ponakin Bridges] comprise a unique pair of structures representing an important aspect of American's engineering heritage, and HAER encourages your efforts to nominate them to the National Register of Historic Places." After receiving HAER's letter, Phyllis Farnsworth began an aggressive campaign of publicizing the bridge's historic significance and contacted Lancaster's congressman for assistance.[38]

In a stroke of good luck, an incomplete federal flood study of the Nashua River temporarily halted the replacement of the Atherton Bridge in 1978. This allowed the Historical Commission time to apply for, and receive, National Register certification on both the bridges, thus barring the MDPW from using federal funds to demolish the bridges, and bringing the replacement project to a halt. Some members of the community hailed this action, but others disdained the further inconvenience created by closed bridges.

The controversy over Lancaster's Post trusses has attracted the attention of amateur and professional historians, engineers, and industrial archaeologists. Since the late 1970s, a number of reports and studies have been made. In early 1981, students from Worcester Polytechnic Institute completed two projects, the first reviewing the Ponakin bridge's structure and history, and the second developing a public promotion plan for Lancaster bridge preservation. A scenic greenway along the Nashua River is also on the drawing table, and the bridges might be incorporated in a bike and walking path. In 1988 the Lancaster Historical Commission accepted responsibility for the care and maintenance of the Atherton Bridge from the MDPW. Barring misfortune or neglect, Lancaster's Post trusses may survive another century or more.[39]

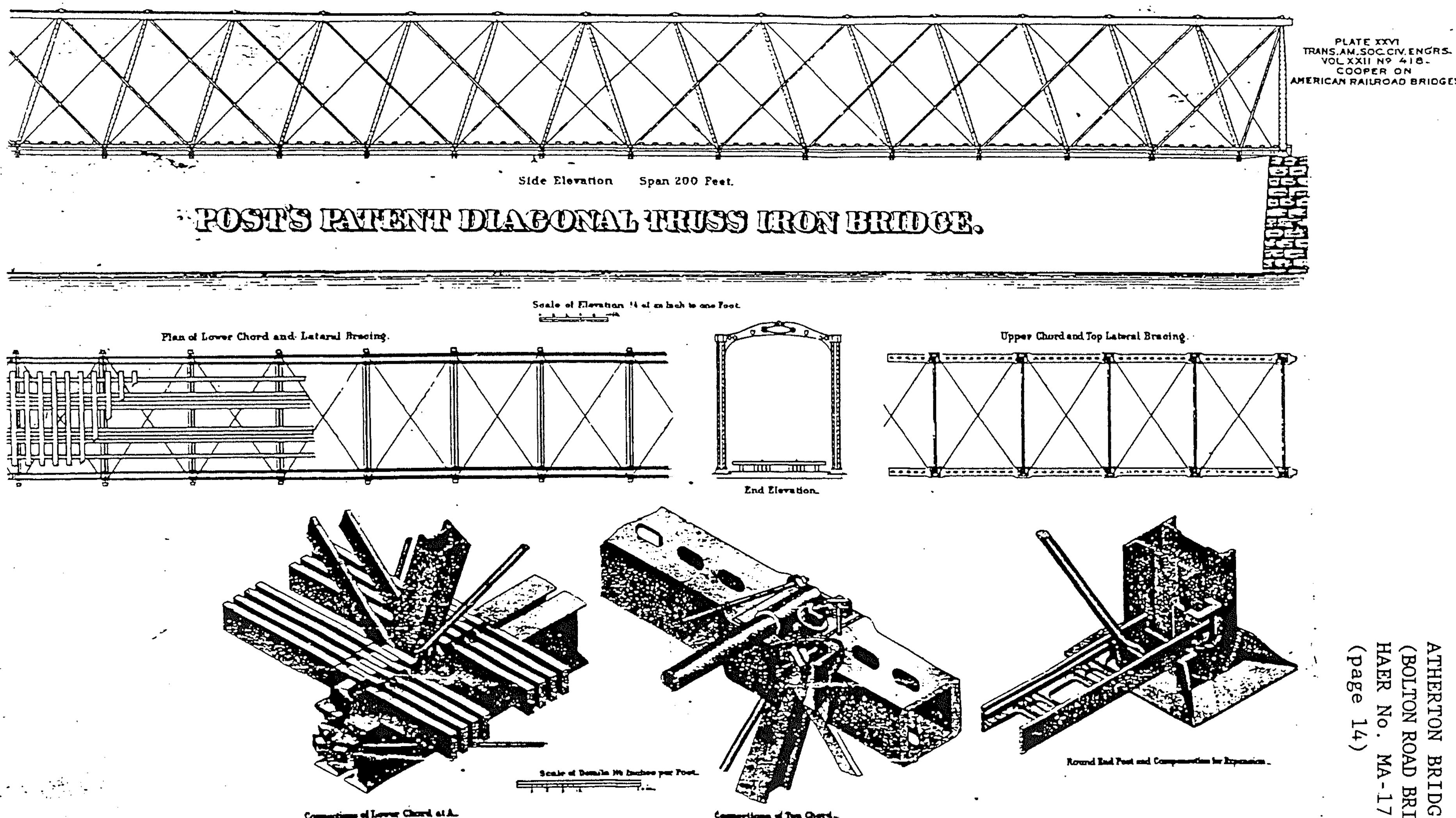


FIGURE 1: Diagram of a Post Truss.
(T. Cooper, "American Railroad Bridges," 1889.)

ATHERTON BRIDGE
(BOLTON ROAD BRIDGE)
HAER No. MA-17
(page 15)

This duty they have assumed, this the law imposes on them, and this those for whom they act have a right to expect. They are not permitted to watch over their own interests; they cannot speak in their own behalf; they must trust to the fidelity of their agents. If they discharge these important duties and trusts faithfully, the law interposes its shield for their protection and defence: if they depart from the line of their duty, and waste or take themselves, instead of protecting, the property and interests confided to them, the law, on the application of those thus wronged or despoiled, promptly steps in to apply the correction, and return to the injured what has been lost by the unfaithfulness of the agents.

This right of the *cestui que trust* to have the sale vacated and set aside, when his trustee is the purchaser, is not impaired or defeated by the circumstances that the trustee purchased for another. [Citing *ex parte* Bennet. 10 Ves. 386.] It follows, therefore, that if defendant Sherman was incapacited to purchase for himself, he was equally incapacitated to act for the defendant Dean; and if Dean were sole purchaser, the purchase would be set aside.

Neither are the duties or obligations of a director or trustee altered from the circumstance that he is one of a number of directors or trustees, and that this circumstance diminishes his responsibility, or relieves him from any incapacity to deal with the property of his *cestui que trust*. The same principles apply to him as one of a number as if he were acting as a sole trustee.

[His Honor next proceeds to decide that the action of the stockholders at the meeting of June, 1867, in ratifying the dealings with Sherman and Dean, was not such a ratification as prevents the company from maintaining their suit; for the general reason that they had not knowledge of all facts. He then states the final conclusion to which he arrives.]

I have arrived at the conclusion, entirely clear to my own mind, that this deed and contract cannot be sustained.

I have arrived at the result without considering the question of fraud raised in the complaint and denied by the affidavits. I have chosen to place my decision on higher and more satisfactory grounds. For the reasons I have stated, the plaintiffs having established a *prima facie* right to have the deed and contract case called and the lands sold reconveyed to them, it is my duty to restrain the defendants until the hearing of this cause, as asked for in the complaints and supplemental complaints.

The plaintiffs have the right to their real estate, or anything into which it has been transmuted.—It is, therefore, proposed to restrain the defendants from transferring the stock owned by them in the Hoffman Coal Company, which but represents the real estate of the plaintiffs, and the privileges and advantages secured by the transportation contracts.

The motion for injunction is therefore granted.

Pacific Railroad.

At the meeting of this company held in St. Louis on the 28th ult., the following gentlemen were elected Directors, viz: J. P. H. Gray, H. L. Patterson, James E. Yeatman, A. Meier, Geo. R. Taylor, Joseph Charless, Robert Campbell, Thomas Allen, Daniel R. Garrison, John M. Wimer, J. W. Glover, Robert Barth.

The report of the company made to the stockholders states that on the 4th of May last, there were 25 miles of new road opened from Jefferson City to California, in Moniteau county; and on the 25th of July following, 12½ miles additional of track was opened; making 37½ miles of new track added to the Pacific road during the year. In addition to this, 19 miles of track on the Southwest Branch, from Franklin to St. Clair station, has been opened. A length of six additional miles on the Southwest Branch is ready for the rails, and will be opened in a few weeks. It is expected also that by the first of October next, the road will be opened to Jamestown, a distance of 104 miles from St. Louis.

The receipts of Transportation Department from opening of road to March 1, 1859, were........................$2,006,824 02
Total expenses of Transportation Department to same date........ 1.270,273 64

Cash balance.......................... $736,550 48

—which sum has been applied to the payment of interest on State bonds, and has reduced the interest account on the books of the company to that amount.

It is estimated that it will require $3,250,000 to complete the road to Kansas City.

TREATISE
ON THE
PRINCIPLES of CIVIL ENGINEERING
AS APPLIED TO THE
CONSTRUCTION of WOODEN BRIDGES.

By S. S. Post, *Civil Engineer*,
And late Chief Engineer of the N. Y. & Erie R. R.

§ 1. *Force* is an agency which, applied to a load, tends to impart motion to it, or to retard it, or to bring it to a state of rest.

§ 2. When two or more forces acting upon a body neutralize each other, the result is an *equilibrium*, called *pressure*.

§ 3. Two weights or pressures are *equal* when one may be substituted for another with similar results.

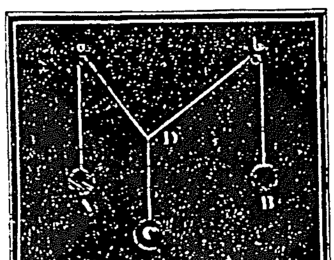
§ 4. If two or more forces act upon the same point, their united effect is called the *resultant* of these forces.

§ 5. The several forces, whose combined effect is equivalent to a single force are called the *components* of that force.

§ 6. The resultant is mechanically equal to its components, and can be substituted therefor; or, the components for the resultant, without change of condition.

This proposition may be illustrated as follows:

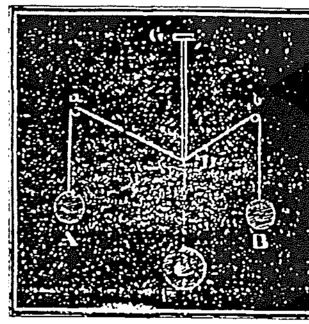
Fig. 1.



a. Let a fine line be passed over two pullies (*a* and *b*) fixed against a vertical plane or wall, and let known weights (A and B) be attached to the ends of the line. At some point (D) in this line, between the pullies, knot another line with a third weight (C) attached. If the weight C be less than the sum of the other weights (A and B) the knot will assume a certain position (D), and it will be found to return to the same point as often as the experiment shall be tried, unless some one or more of the weights be changed.

According to the foregoing definitions the weights (A, B and C) are in equilibrium. A and B, as components, act upon the point D, with the same effect as their resultant C. But, the force A is equally the resultant of B and C, as components: and B may, also, be considered the resultant of A and C.

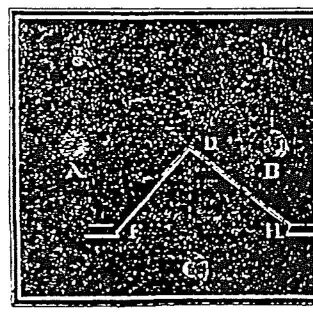
Fig. 2.



b. If a rod be fixed vertically between the point D and the ceiling—or some other immovable object (G), then by removing the weight C the point D remains in the same position as before.

The pressure upon the rod will be equal to the weight C removed, and is the resultant of the weights A and B.

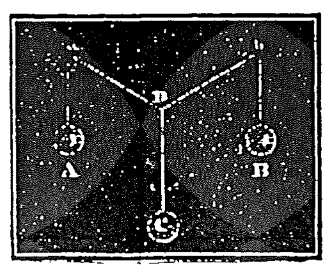
Fig. 3.



c. The point D, instead of being supported by weights, acting in the direction D*a* and D*b*, may be sustained by rods or struts (DF and DH,) pressing against it. The same weight (C) being suspended from the point D, the rod DF will sustain a force equal to that which was in the former case exerted by the weight B in the direction D*b*; and DH a force equal to that which was exerted by the weight A in the direction D*a*.

§ 7. If three forces act upon one point, and keep it at rest, then those three forces are proportional to the three sides of a triangle, to which sides, also, the directions in which they act are parallel.

Fig. 4.



APPENDIX A: Page from Post's "Treatise on the Principles of Civil Engineering, as Applied to the Construction of Wooden Bridges," 1859.

ATHERTON BRIDGE
(BOLTON ROAD BRIDGE)
HAER No. MA-17
(page 16)

UNITED STATES PATENT OFFICE.

SIMEON S. POST, OF JERSEY CITY, NEW JERSEY.

IMPROVEMENT IN IRON BRIDGES.

Specification forming part of Letters Patent No. 38,910, dated June 16, 1863.

To all whom it may concern:

Be it known that I, S. S. POST, of Jersey City, county of Hudson, State of New Jersey, have invented a new and Improved Method of Constructing Iron Bridges; and I do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawings and the letters of reference marked thereon.

The nature of my invention consists in constructing an iron bridge in such a manner as that the expansion and contraction of the material will not produce injurious effects upon the structure, and in this manner obviating one of the most serious objections to the universal use of such bridges.

To enable others skilled in the art to make and use my invention, I will proceed to describe its construction more minutely.

Figure 1 shows a side elevation of two panels of one end of a truss or girder. Fig. 2 shows a plan of the chord and its attachments. Fig. 3 shows an end view of a post with the attachment of the chord and top plate. Fig. 4 shows a side view of a post. Fig. 5 shows a plan of the upper plate or chord used by me.

I fasten the pedestal A by means of suitable bolts to the masonry or proper abutment, which pedestal is made to receive the end post of the bridge, which post is rounded at the bottom, as shown at B, and held in the pedestal (which has a lip, d) by the bolt g, passing through both, the pedestal and the slot e in the chord F, to which chord I attach the brace f', which is fastened with the strut or post H to the top chord or plate, J, by means of a bolt, k, passing through the joint box L, as shown in Fig. 5, k. The joint-box is used for the purpose of connecting the sections of the top chord or plate in such a manner that by passing the bolt k through the struts and braces will allow both to revolve upon said bolt to an extent corresponding to the degree of the expansion or contraction. The joint-box may be placed upon the struts, and the braces g' and h' may be introduced, as shown in Fig. 3, at R, and the bolt k passed through, as shown in Fig. 1 at P, after which the sections of the plate or upper chord may be attached to the box by bolts m m.

Having thus described my invention, what I claim, and for which I desire to secure Letters Patent, is—

1. The joint-box connecting segments of the top chord or plate, and also receiving the heads of the posts or struts and braces, with the loose pin k passing through the whole.

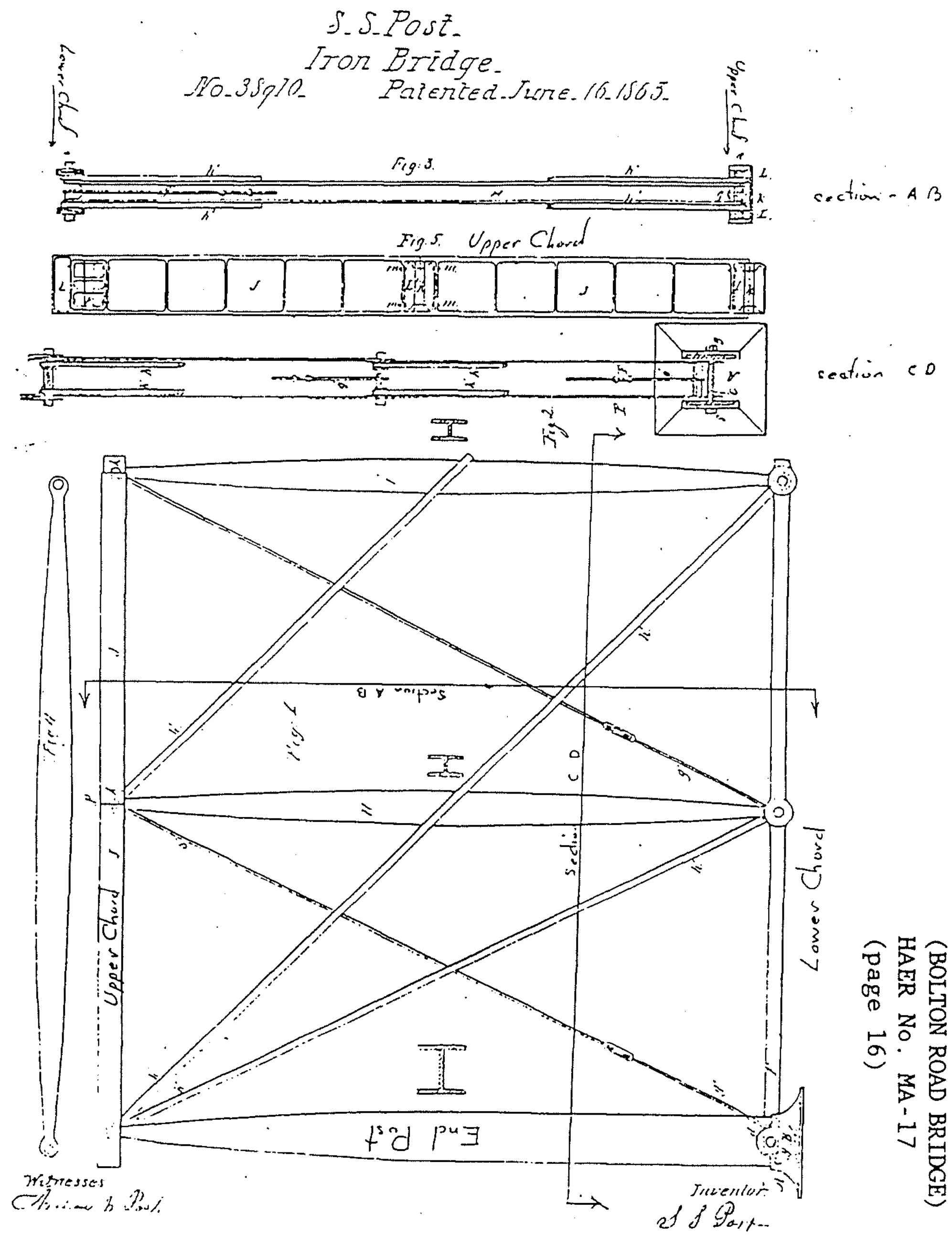
2. A cylindrical joint in the construction of a bridge, as shown at B, irrespective of its location, when used for the purpose of obviating the dangers of expansion and contraction.

3. The slotted chord, when used in connection with the cylindrical joint and for the same purposes.

4. The construction of the chord, when used in combination with the cylindrical joint, substantially as described and shown.

S. S. POST.

Witnesses:
ANDREW J. POST,
O. A. STEVENS.



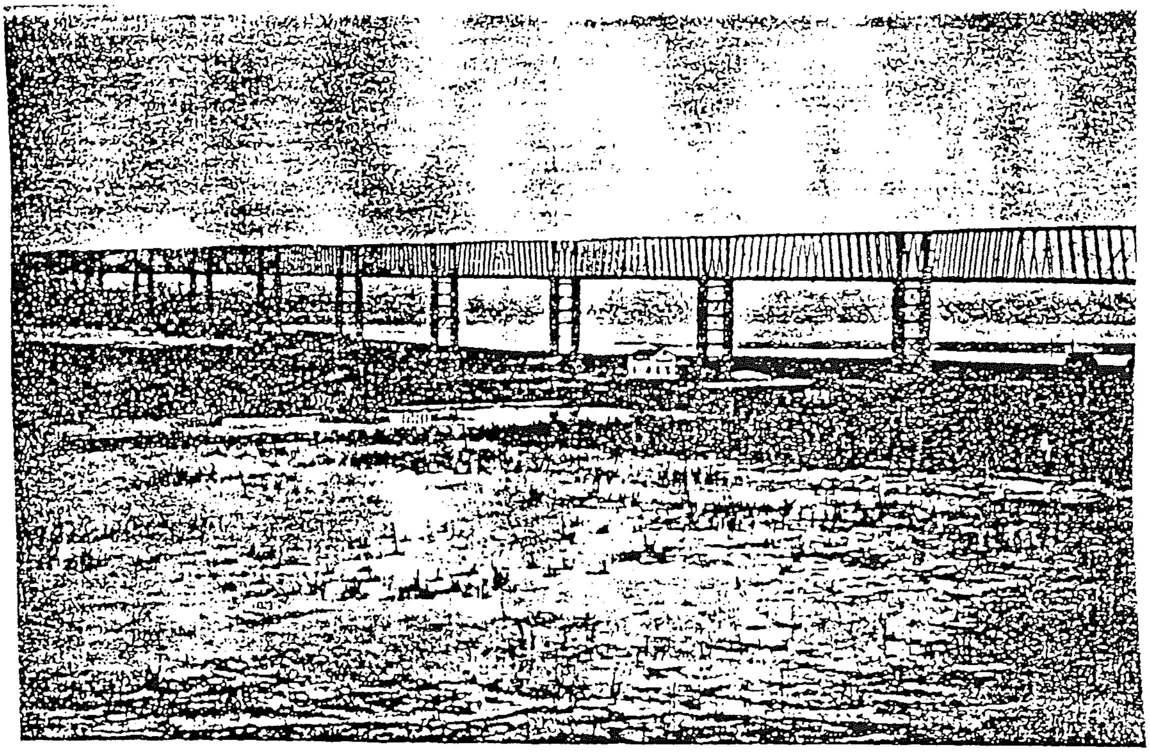
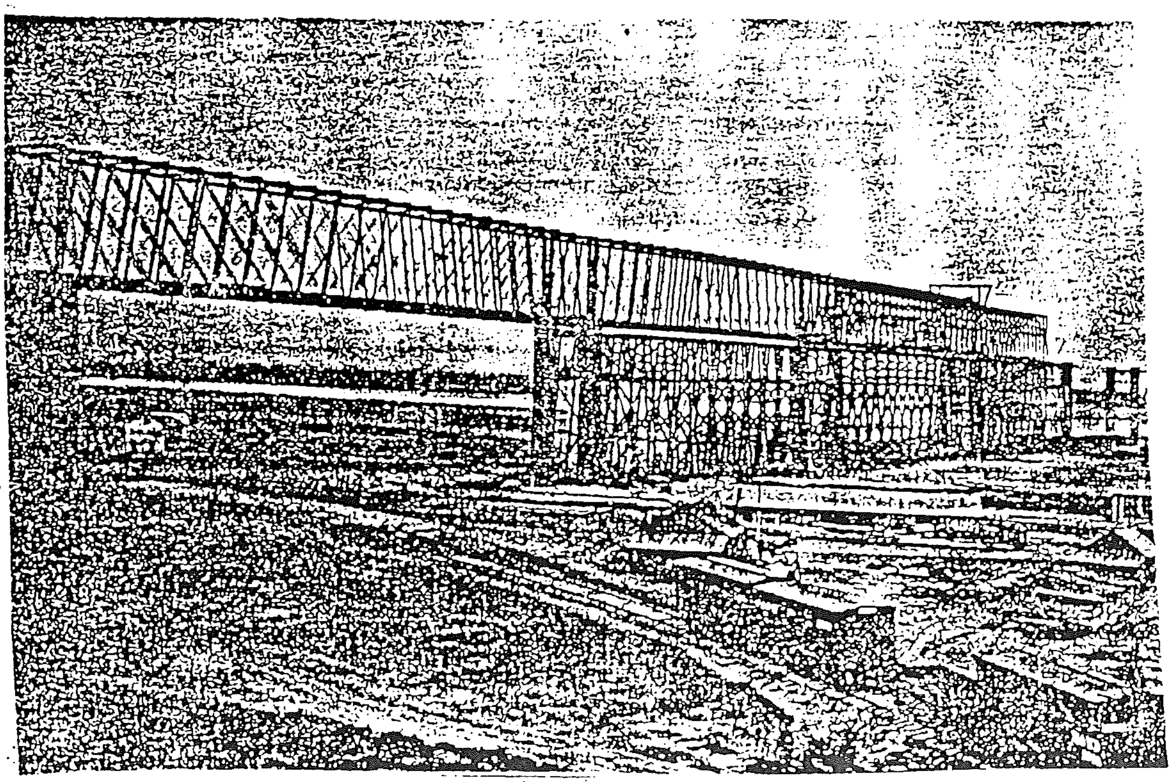


FIGURE 2: Union Pacific Railroad Bridge, Omaha, Nebraska.
(Condit, American Building Art, 1960, p. 147.)



ENDNOTES

1. Carl W. Condit, American Building Art: The Nineteenth Century (New York: Oxford University Press, 1960), pp. 145-46.

2. The author has heard of only two other surviving Post trusses: the Bell's Ford Bridge in Seymour, Indiana, and another bridge in Newark, Ohio. Committee on History and Heritage of American Civil Engineering, "American Wooden Bridges," (New York: American Society of Civil Engineers, 1976).

3. The authority for the classic Post truss is an illustration from Theodore Cooper, "American Railroad Bridges," Transactions of the American Society of Civil Engineers, vol. 21 (1889), plate 26. The Atherton Bridge differs in so many ways from the classic design, that a case could be made that it is not a Post truss, but an extremely unusual hybrid truss form. Nevertheless, historically the Atherton Bridge has been described as best resembling a Post truss, and will be treated as such in this report.

4. "Memorial to Simeon S. Post," Proceedings of the American Society of Civil Engineers, vol. 19 (1893), pp. 49-50.

5. William H. Wisely, The American Civil Engineer, 1852-1974: The History, Traditions, and Development of the ASCE (New York: American Society of Civil Engineers, 1974), pp. 77-79.

6. Condit, pp. 103-124.

7. Ibid., pp. 109-118.

8. Ibid., p. 107.

9. "Memorial to Simeon S. Post," p. 49.

10. Daniel H. Calhoun, The American Civil Engineer, Origins and Conflict (Cambridge, 1960), pp. 4-30; "Memorial to Simeon S. Post," p. 49; and, Wisely, pp. 14-18.

11. Even though Whipple's book had been published over a decade earlier, it still had not made much impact upon bridge builders. Simeon S. Post, "Treatise on the Principles of Civil Engineering as Applied to the Construction of Wooden Bridges," American Railroad Journal, vol. 15 (April-November 1859), pp. 226-29, 243-45, 258-61, 274-76, 290-92, 308-10, 323-25, 340-43, 358-59, 372-73, 389-91, 405-06, and 421-23.

12. Victor Darnell, Directory of American Bridge Building Companies, 1840-1900 (Washington, DC: Society for Industrial Archeology, 1984), pp. vii-ix.

13. Post's patent drawings closely match the configuration of joints at the Ponakin Bridge (HAER No. MA-13). Simeon S. Post, "U.S. Patent No. 38,910," June 16, 1863.

14. "Memorial to Simeon S. Post," p. 50.

15. Ibid.

16. Condit, pp. 145-46.

17. Ibid.; and Tyrrell, pp. 175-76. Whether Post, or firms licensed by Post, built these bridges is unknown. Research in the Midwest would be necessary in order to build a fuller picture of the history of the Post truss.

18. A good introduction to nineteenth-century trusses can be found in: T. Allan Comp and Donald Jackson, Bridge Truss Types: A Guide to Dating and Identifying, Technical Leaflet 95, American Association for State and Local History, May 1977.

19. Col. William E. Merrill, Iron Truss Bridges for Railroads: Methods of Calculating Strains with a Comparison of the Most Prominent Truss Bridges, and New Formulas for Bridge Computations; also, the Economical Angles for Struts and Ties (D. Van Nostrand, 1870), pp. 85-92, and 128-30.

20. Squire Whipple, "On Truss Bridge Building," Transactions of the American Society of Civil Engineers, vol. 1 (1872), pp. 239-44.

21. As part of their senior thesis on the Ponakin and Atherton Bridges, Gregory P. Stanford and Michael A. Thompson (Worcester Polytechnic Institute) claimed that their structural analysis of the Ponakin Bridge probably proves that Post had economy of material in mind when he inclined the truss's posts. However, without further evidence, this assertion cannot be verified. Gregory P. Stanford and Michael A. Thompson, "Structural and Historic Aspects of Post Patent Trusses in Lancaster, Massachusetts," Senior Thesis, Worcester Polytechnic Institute, May 20, 1981.

22. Photocopies of photographs in a letter from Douglass L. Griffin (HAER) to Phyllis Farnsworth, July 26, 1978, Ponakin Bridge file, Lancaster Historical Commission, Lancaster, Massachusetts.

23. J.A.L. Waddell, Bridge Engineering (New York: John Wiley & Son, 1916), p. 347; Darnell, p. 33; Condit, pp. 145-50; and, Comp and Jackson, p. 3.

24. George Fillmore Swain, Structural Engineering: Stresses, Graphical Statics, and Masonry (1927), p. 129.

25. Abijah P. Marvin, History of the Town of Lancaster, 1650-1879 (Lancaster, Massachusetts: Town of Lancaster, 1879).

26. Ibid.

27. Ibid., pp. 442-43.

28. Henry S. Nourse, "Annotations of Marvin's History of Lancaster," p. 451, Lancaster Historical Commission Collection.

29. Comp and Jackson, p. 2; Tyrrell, pp. 137-38; Reports of the Town of Lancaster, various years, 1810-1870, Lancaster Public Library Collection.

30. Lancaster League of Historical Societies, Towns of the Nashaway Plantation (Lancaster, Massachusetts: Lancaster League of Historical Societies, 1976), pp. 194-97; Andrew E. Ford, History of the Origin of the Town of Clinton, 1653-1865 (Clinton, 1896); and, "Ponakin Mills Closed 1927," Ponakin Mills File #919, Lancaster Historical Commission.

31. "Nathaniel Thayer," Dictionary of American Biography, Vol. IX (New York: Charles Scribner & Sons, 1935), pp. 409-10; and, Dr. J.L.S. Thompson, personal journal, p. 91, Lancaster Historical Commission Collection.

32. "Report of the Bridge Committee, 1870" Cabinet #2, Drawer #3, Folder #3, Lancaster Historical Commission; and Town Reports, 1870-71, p. 7.

33. The town treasurer kept a detailed record of bridge expenses. J.H. Cofrode & Company received $2312.50 for the iron truss, and the total cost of the bridge amounted to $4,114,43. Town Reports, 1870, p. 7; and, The Lancaster and Sterling Directory, Dec. 1880.

34. Ford, History of Clinton, pp. 379-80; and, Clinton Courant, Nov. 5, 1870.

35. J.L.S. Thompson, personal journal, p. 91.

36. Town Reports, 1910, p. 38.

37. Kathleen Shaw, "New Bridge Waits as Planners Work," Worcester Telegram, Aug. 26, 1980; Phyllis Farnsworth, "Atherton Bridge Threatened," Clinton Daily Item, Sept. 3, 1977; and, Ponakin and Atherton Bridge files, Lancaster Historical Commission.

38. Douglass L. Griffin to Phyllis Farnsworth, July 26, 1978, Atherton and Ponakin Bridge files, Lancaster Historical Commission.

39. Phyllis Farnsworth to Ellen Digerinimo, November 3, 1988, Atherton Bridge files, Lancaster Historical Commission.

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HAER No. MA-17

HISTORIC AMERICAN ENGINEERING RECORD

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Atherton Bridge
Spanning Nashua River on Bolton Road
Lancaster Vicinity, Massachusetts
Worchester County

Jet Lowe, Photographer 1979

MA-17-1	"BARREL SHOT" SHOWING WOODEN DECK
MA-17-2	GENERAL VIEW SHOWING UPSTREAM TRUSS
MA-17-3	DETAIL ELEVATION VIEW SHOWING END OF TRUSS
MA-17-4	DETAIL VIEW OF LOWER CHORD SCREW CONNECTION
MA-17-5	DETAIL VIEW OF UPPER CHORD PIN CONNECTION
MA-17-6	"NIGHT VIEW" OF END POST

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Addendum to
Atherton Bridge (Bolton Road Bridge) HAER No. MA-17
Spanning the Nashua River on Bolton Road
Lancaster
Worcester County
Massachusetts

Martin Stupich, Photographer, Summer 1990

Photographs MA-17-1 through MA-17-6 were previously transmitted to the Library of Congress.

MA-17-~~6~~ 7	General view of east portal from roadway, looking west
MA-17-~~7~~ 8	General oblique view of south truss, looking southwest
MA-17-~~8~~ 9	Detail of northwest endpost
MA-17-~~9~~ 10	End panels of north truss at west end, showing complex bracing configuration
MA-17-~~10~~ 11	General view of bridge elevation, looking north
MA-17-~~11~~ 12	Detail of center of span, south truss
MA-17-~~12~~ 13	Detail, west end of south truss, showing representative bolted connections at bottom chord
MA-17-~~13~~ 14	Oblique view of deck bracing and multiple-member lower chord, looking northeast
MA-17-~~14~~ 15	Detail of south truss, showing upper chord connections
MA-17-~~15~~ 16	Connection S-U-4, showing diagonal members slipped from casting
MA-17-~~16~~ 17	Connection S-U-10, showing male and female components revealed by stress gap
MA-17-~~17~~ 18	Detail of post connection, center top chord of south truss, showing pin revealed by gap
MA-17-~~18~~ 19	Connection S-L-2, showing rod-post-chord connection
MA-17-~~19~~ 20	Southeast bearing shoe connection
MA-17-~~20~~ 21	Underside of deck, looking west
MA-17-~~21~~ 22	Abutment at northeast corner

LAN.919

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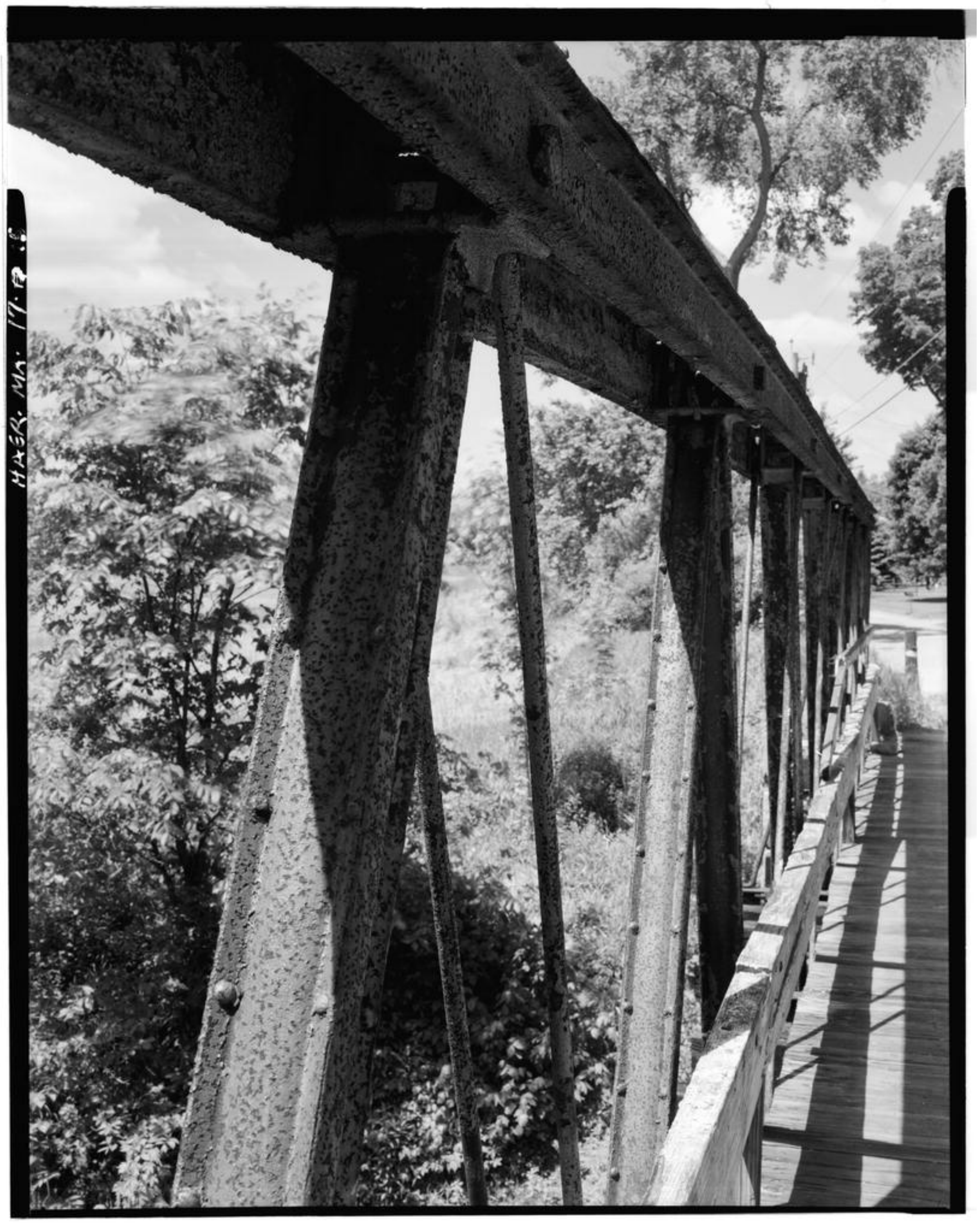

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HISTORIC AMERICAN ENGINEERING RECORD
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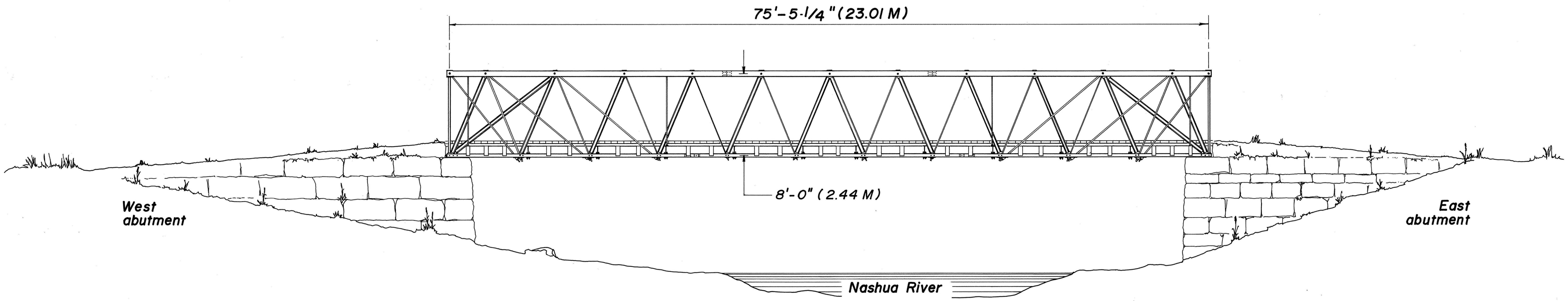
HAER No. MA-17-22

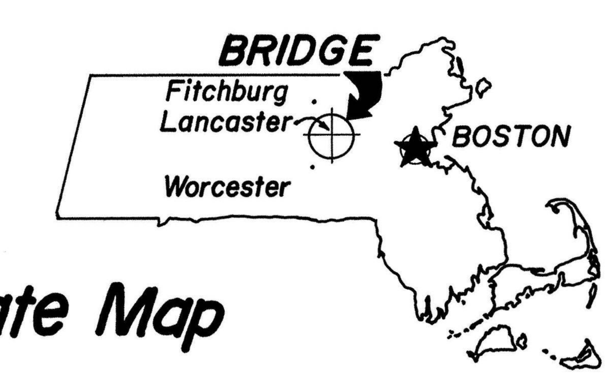
ATHERTON BRIDGE · 1870
LANCASTER, MASSACHUSETTS



South Elevation Scale: 3/16"=1'-0"

0 1 2 3 4 5 10 15 20 FEET

0 1 2 3 4 5 METERS 1:64



State Map

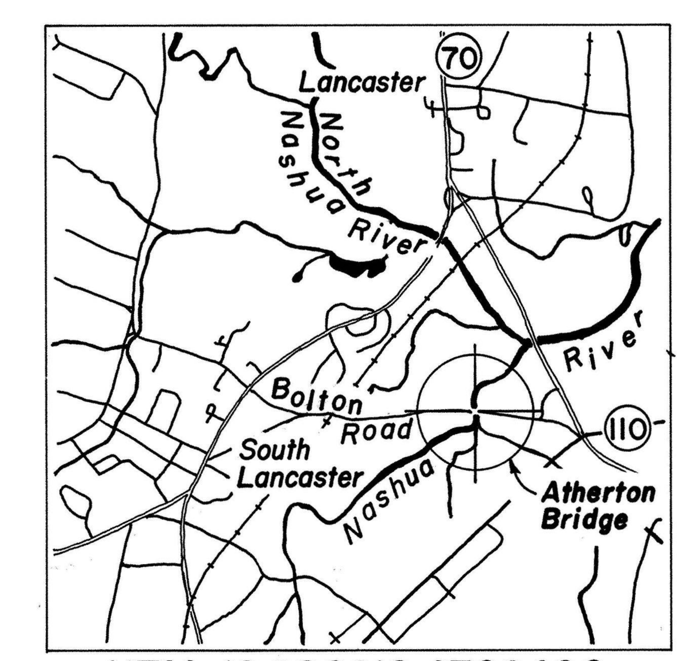
The Atherton Bridge (1870) is a variation on the truss designed by civil engineer Simeon S. Post (1805–1872). The Post truss enjoyed a short period of popularity in the late 1860's and early 1870's and was used widely for long-span railway bridges. The builders of the Atherton Bridge, J.H. Cofrode and Company of Philadelphia, probably adapted the Post truss form for use in small highway bridges.

The Atherton Bridge has posts that incline towards the middle of the bridge and diagonals that incline towards the granite abutments. Although the bridge incorporates this hallmark of the Post truss, it differs from the classic Post design in most other respects. Unusual features of the Atherton Bridge include double end posts with adjustabe turnbuckles, channeled castings to join the lower chord bars, and Pheonix columns for all inclined posts. This bridge does not make use of Post's patented joints.

The Atherton Bridge was Lancaster's first iron truss. Since the late–seventeenth century, wooden bridges spanned the Nashua River at the site of the Atherton Bridge, but they had been frequently washed away by floods. The town's citizens hoped that the new iron bridge would prove a more reliable connection between the farmland to the east and the small commercial village to the west.

The Atherton Bridge has not been significantly altered, although it has sustained structural damage; joints have been dislocated and the northeast endpost is missing. Most Post trusses were destroyed or replaced in the early - twentieth century, and fewer than five are known to survive. In 1979 the National Register of Historic Places listed the Atherton Bridge for its local and national significance.

The Massachusetts Historic Bridge Project is part of the Historic American Engineering Record (HAER), a long-range program to document historically significant engineering and industrial sites in the United States. The National Park Service, U.S. Department of the Interior, administers the HAER program. The Massachusetts Department of Public Works, Jane F. Garvey, Commissioner, George R. Turner, Jr., Chief Engineer, and Stephen J. Roper, Historic Bridge Specialist; and the Historic American Engineering Record (HABS/HAER), Dr. Robert J. Kapsch, Director, co-sponsored the Massachusetts Historic Bridge Project with the cooperation of the Massachusetts Historical Commission, Elsa Fitzgerald, Acting Exec. Director. The field team under the direction of Eric DeLony, Chief and Principal Architect, HAER, consisted of Daniel L. Schodek, professor of architectural technology (Harvard University), field supervisor, Patricia Reese (Boston Architectural Center), Gary Kleinschmidt (Harvard University), Chris Payne (Columbia University), Morgan Fleisig (Harvard University), Mark Rowan (Catholic University of America), and Rudolf Sosef (Technical University of Delft, the Netherlands, US/ICOMOS), architectural technicians; Lola Bennett (University of Vermont), Patrick Harshbarger (University of Delaware/Hagley Museum and Library), and John Healey (University of Birmingham, England, US/ICOMOS), historians; and Marty Stupich (Massachusetts College of Art), photographer.



UTM 19.280210.4702400

Based on U.S.G.S. 7.5x15 min. series topographic map, Hudson Quadrangle 1980 (edited 1988).

Local Map

Scale: 1:25,000

0 1/2 1 1 1/2 Mi.

0 1 2 Km

DELINEATED BY: MARK C. ROWAN, 1990

MASSACHUSETTS HISTORIC BRIDGE PROJECT
NATIONAL PARK SERVICE
UNITED STATES DEPARTMENT OF THE INTERIOR

LANCASTER

ATHERTON BRIDGE (BOLTON ROAD BRIDGE) – 1870
Spanning the Nashua River on Bolton Road
WORCESTER COUNTY

MASSACHUSETTS

SHEET 1 OF 3

HISTORIC AMERICAN ENGINEERING RECORD
MA – 17

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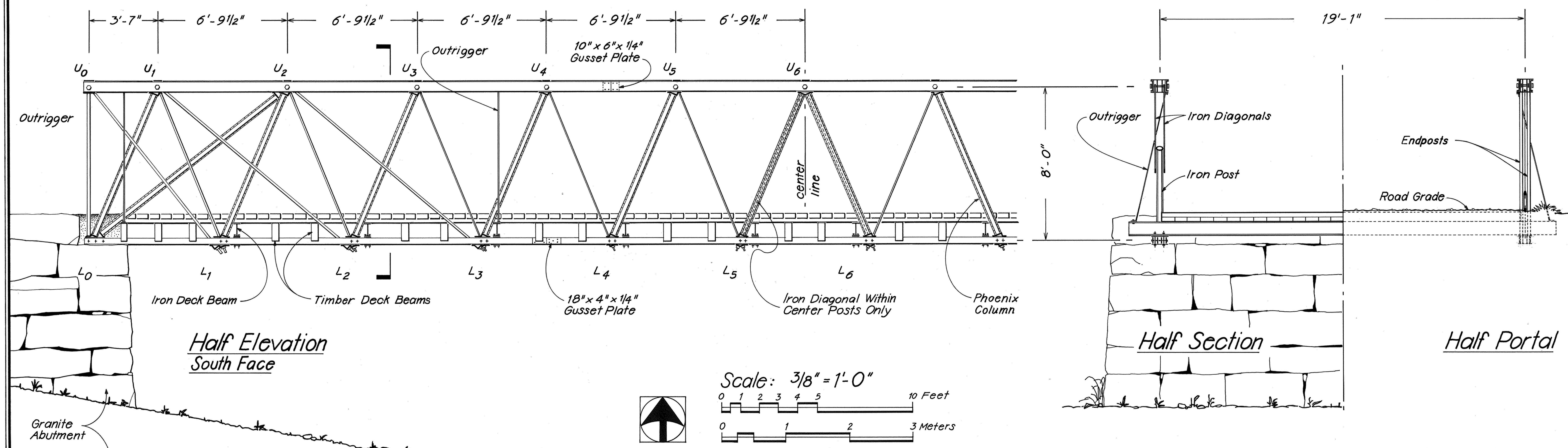
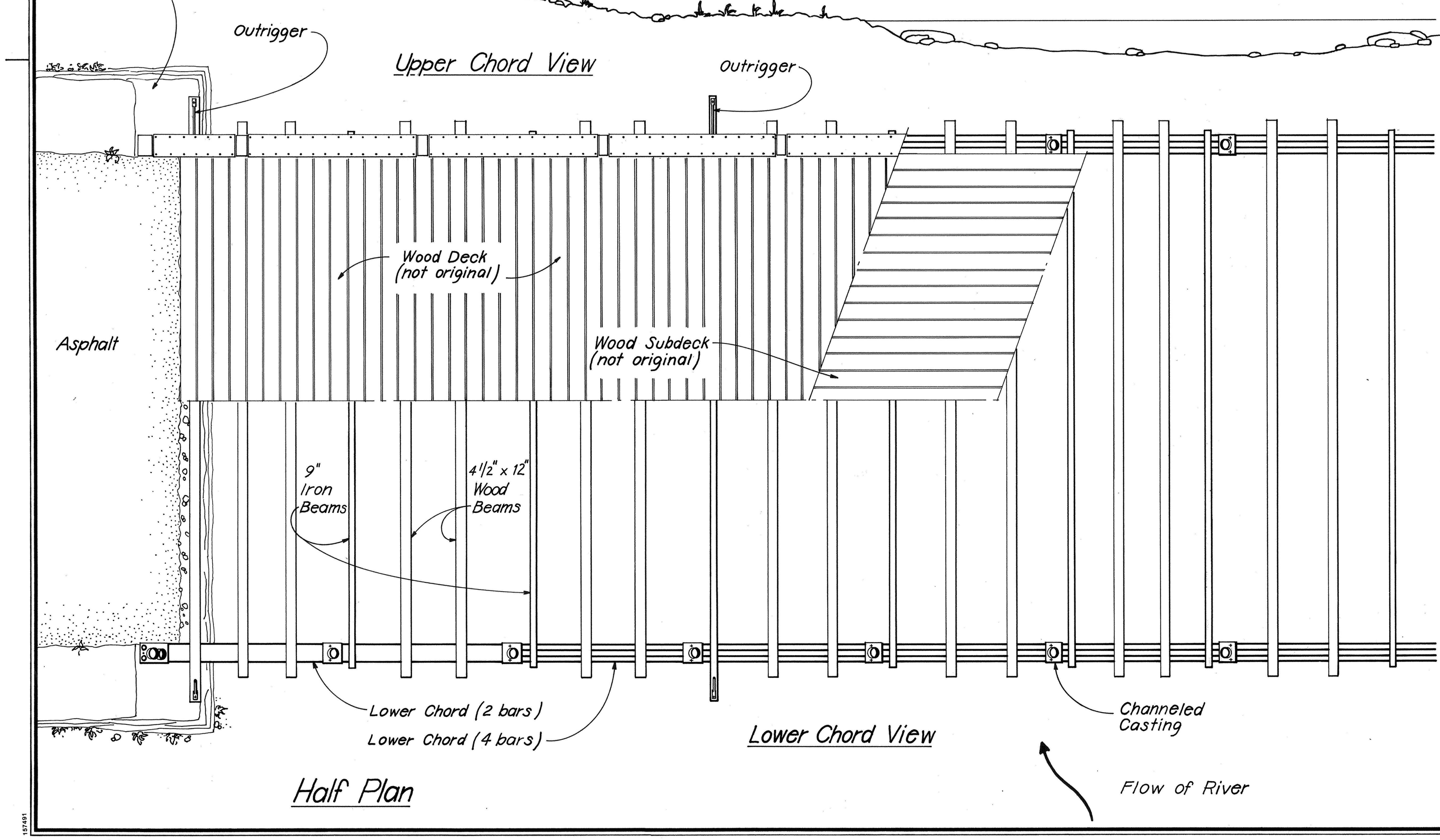
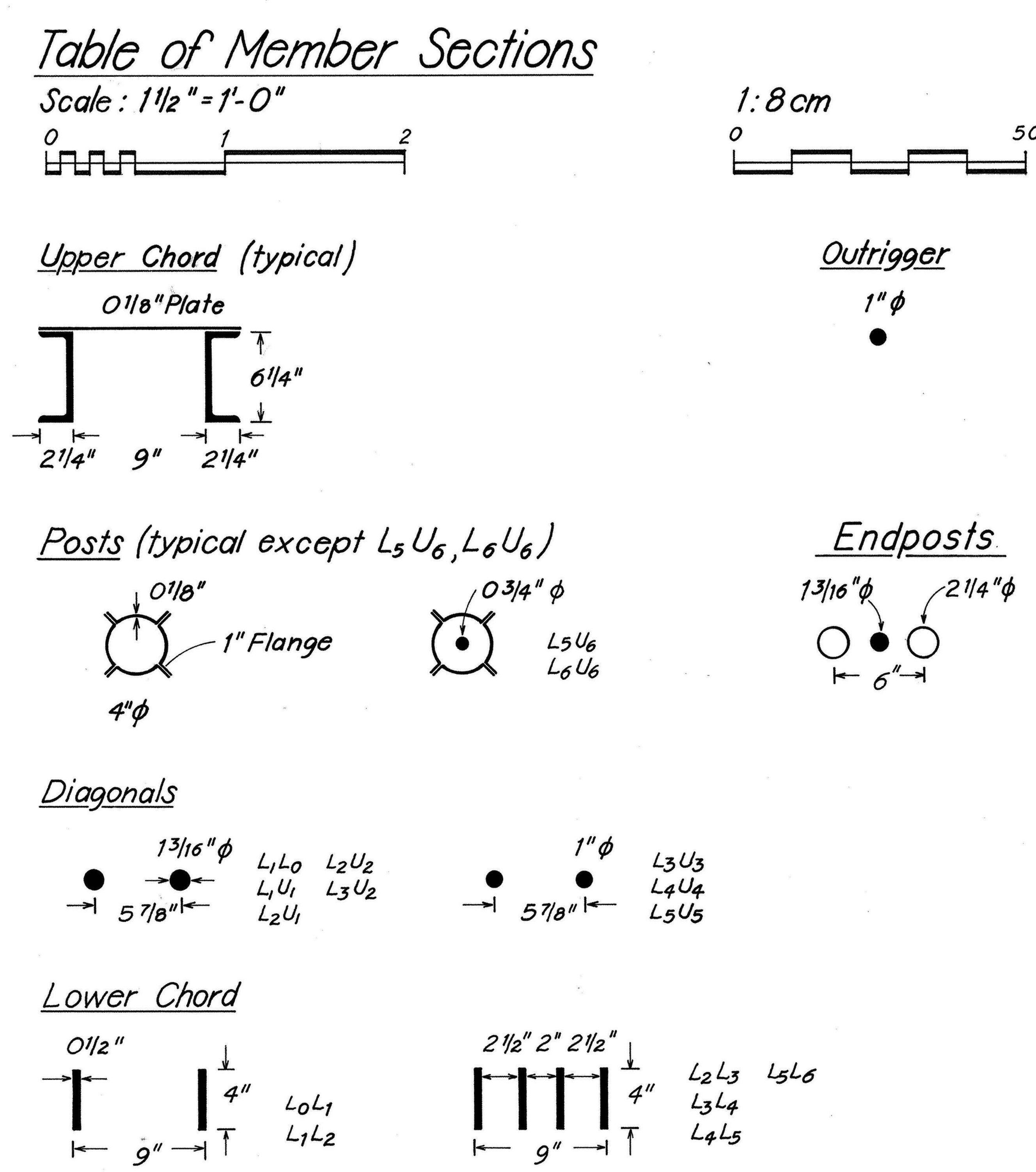




The inwardly sloping diagonals are wrought-iron Phoenix columns which are connected to other members by cast-iron fittings. Diagonals and tension chords are also of wrought iron. Decking and stringers are timber.



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MASSACHUSETTS HISTORIC BRIDGE PROJECT

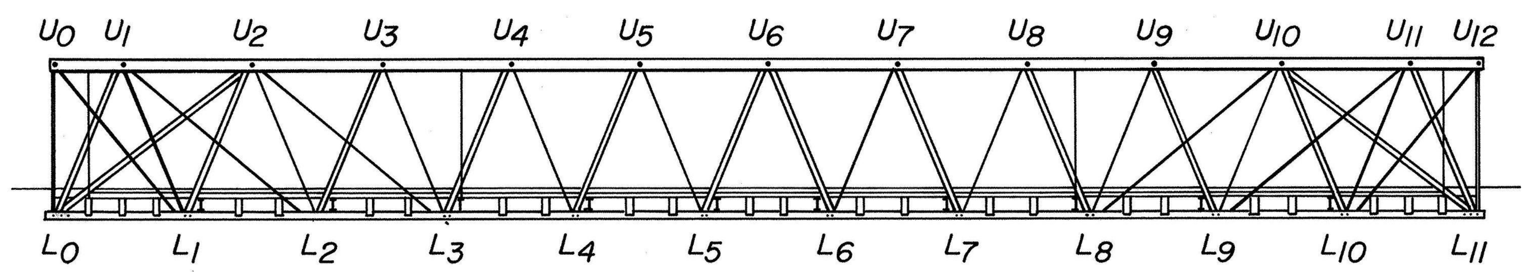
NATIONAL PARK SERVICE
UNITED STATES DEPARTMENT OF THE INTERIOR

ATHERTON BRIDGE (BOLTON ROAD BRIDGE) - 1870
Spanning the Nashua River on Bolton Road

LANCASTER WORCESTER COUNTY MASSACHUSETTS

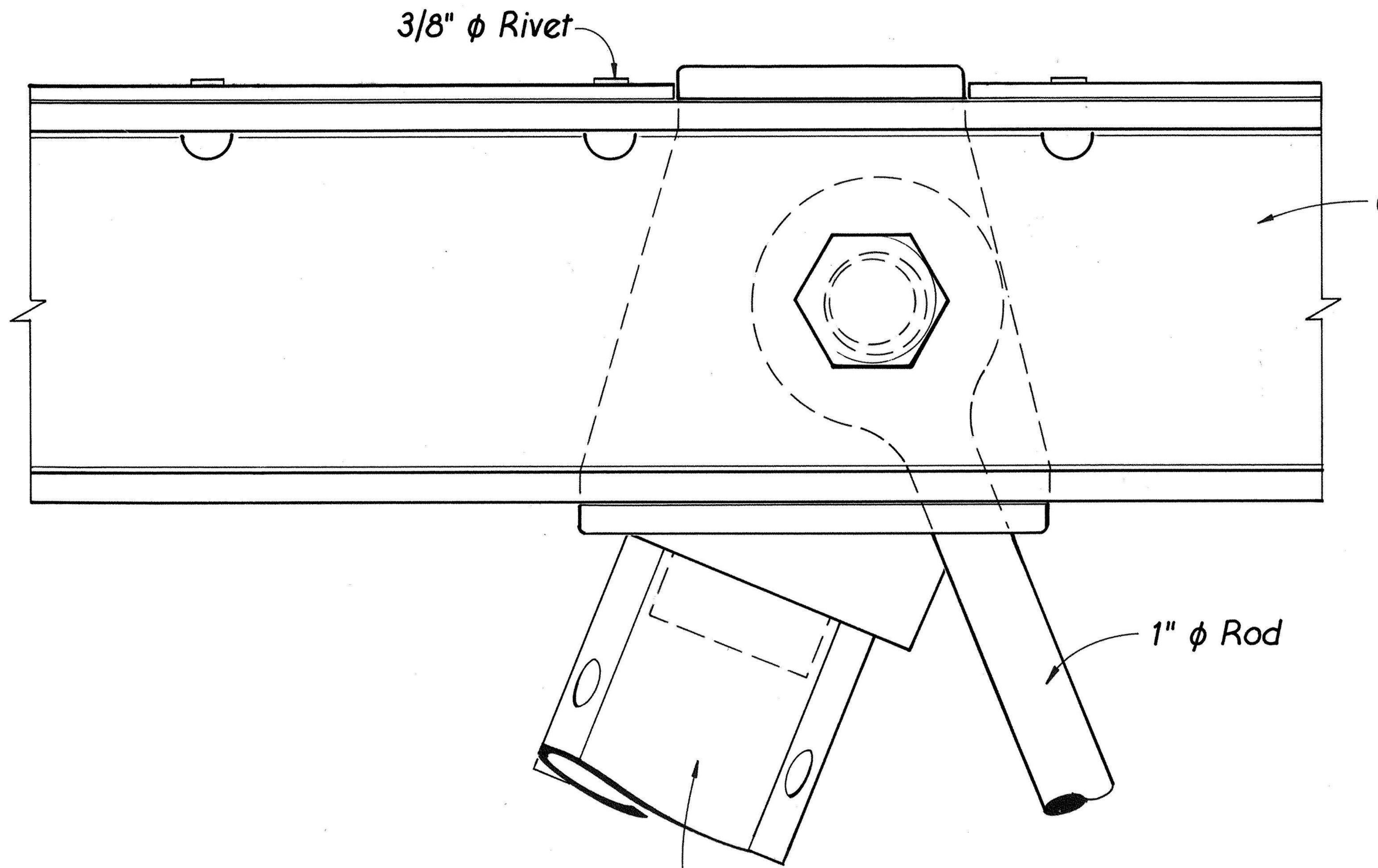
SHEET 2 of 3

HISTORIC AMERICAN ENGINEERING RECORD
MA - 17

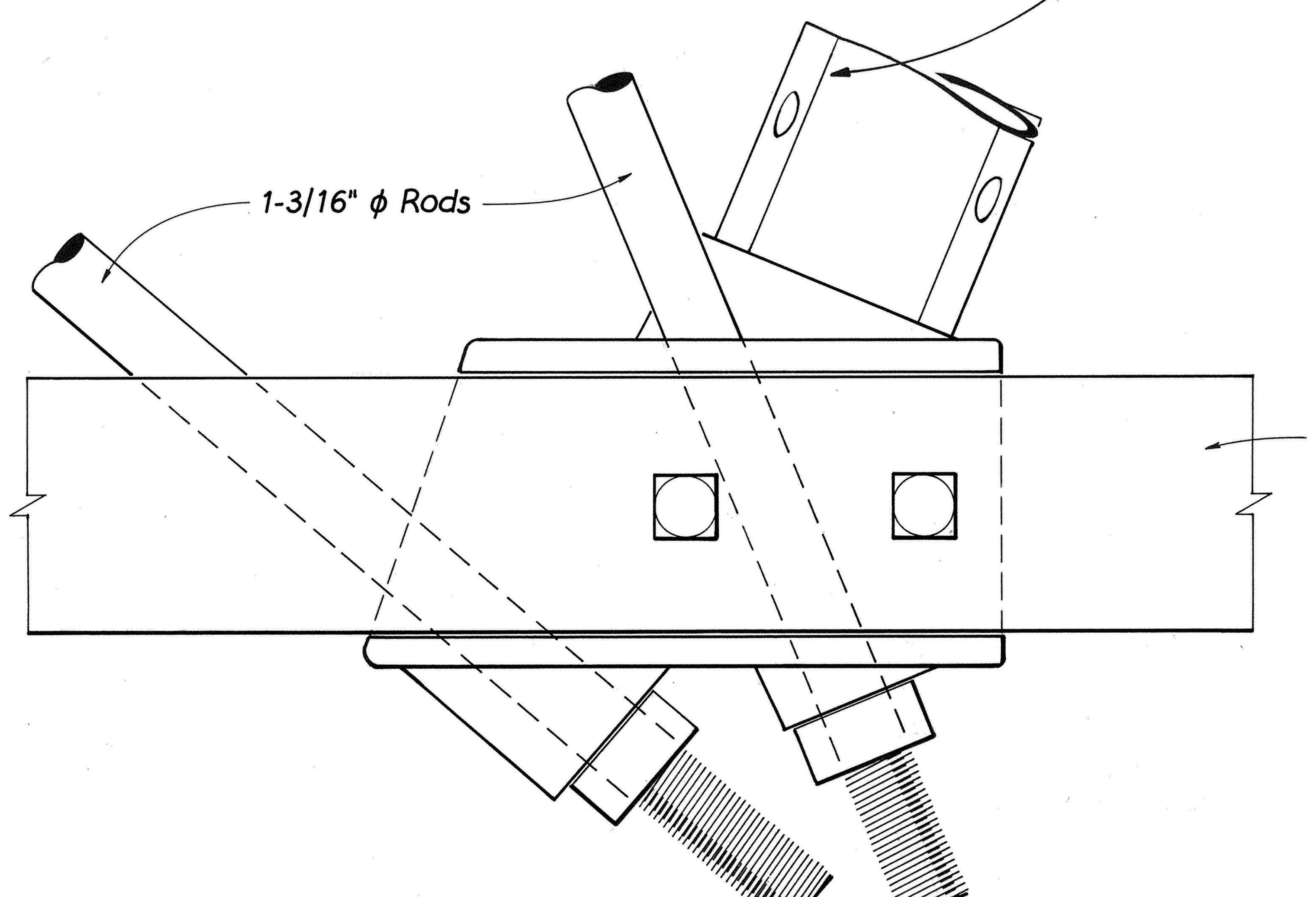


Elevation U3

Joint connections: cast iron
Members: wrought iron typical

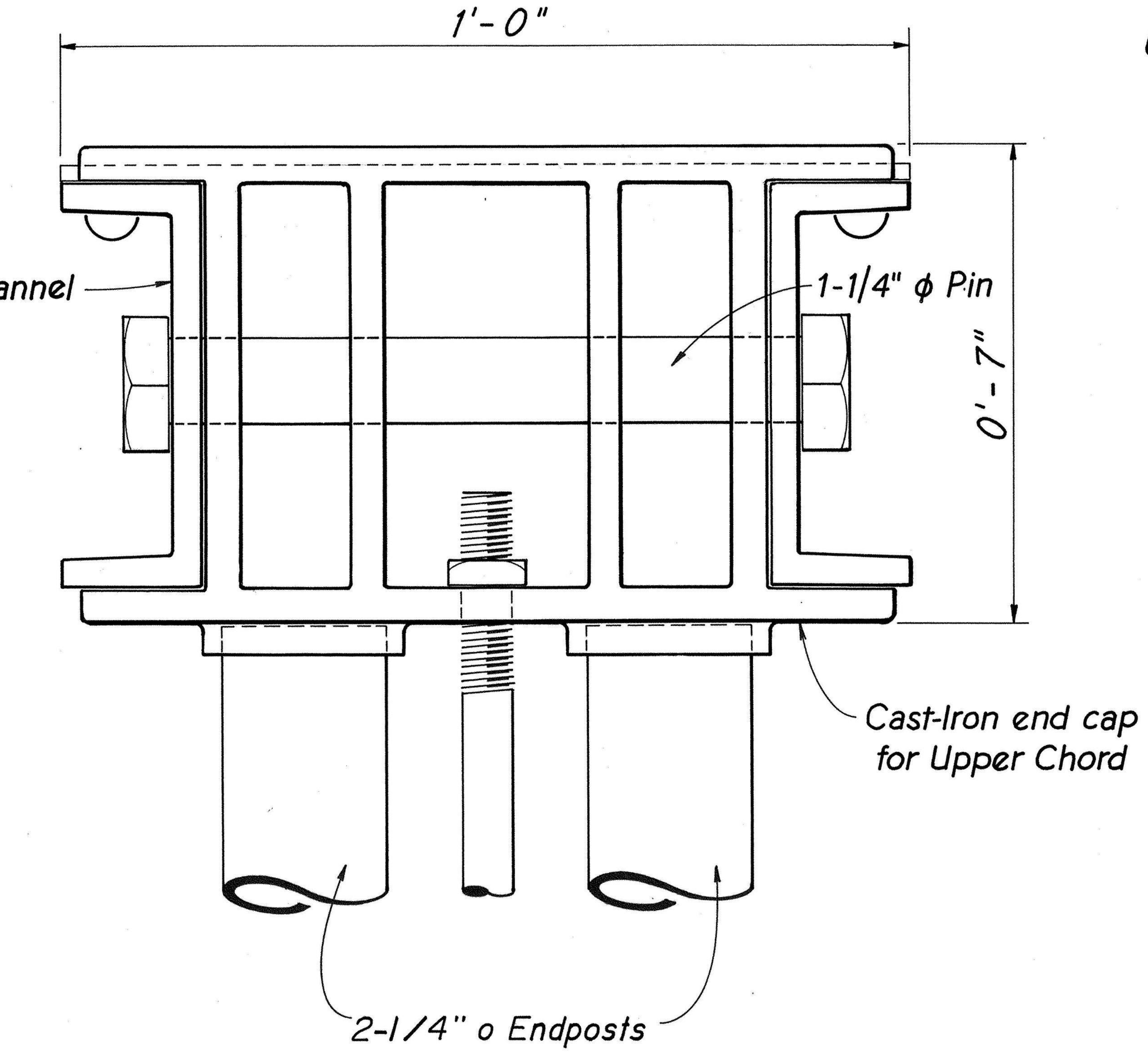


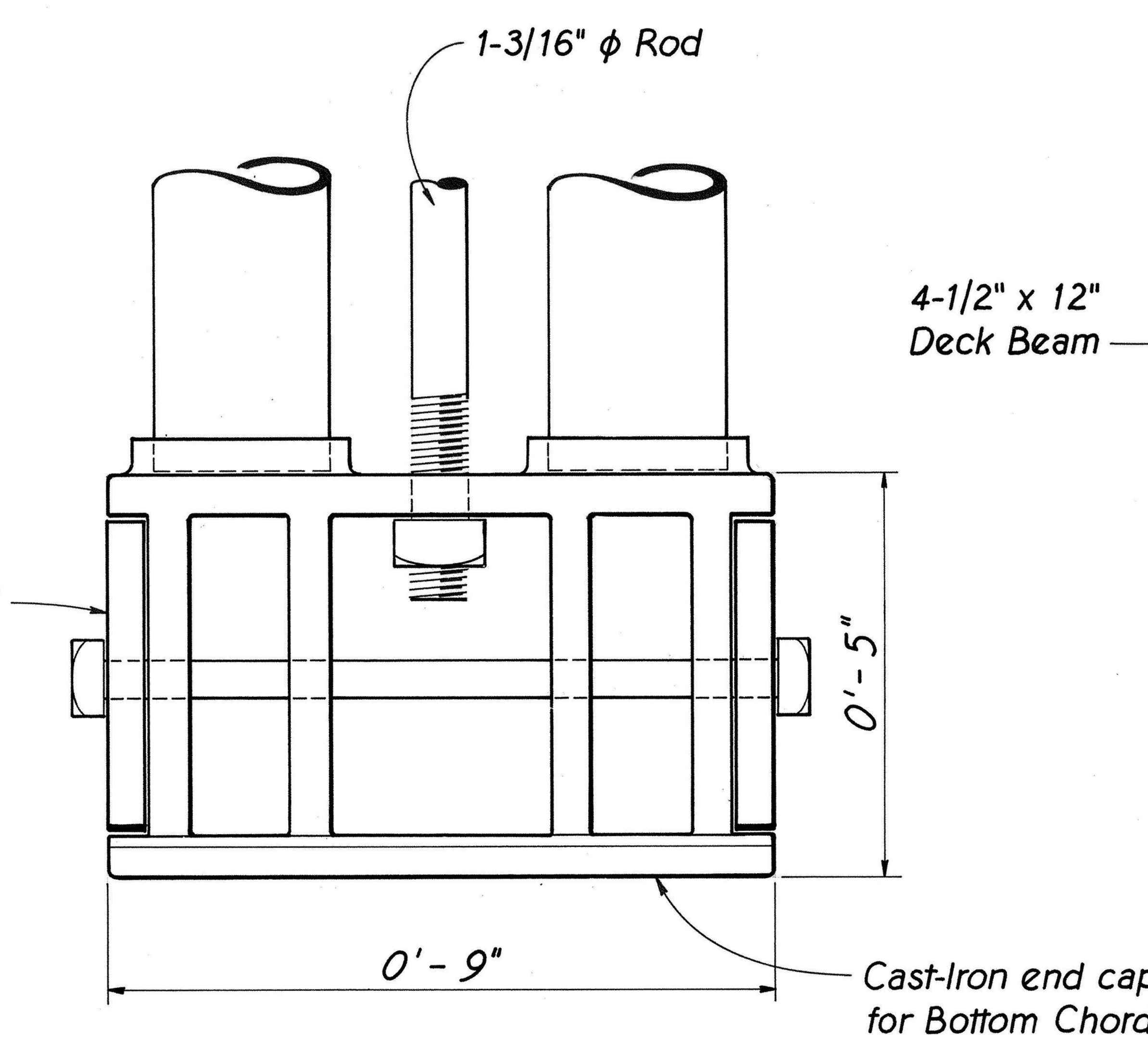
Scale: 6" = 1'-0"
0 1 2 3 4 5 6 INCHES
0 5 10 15 CENTIMETERS
1:2



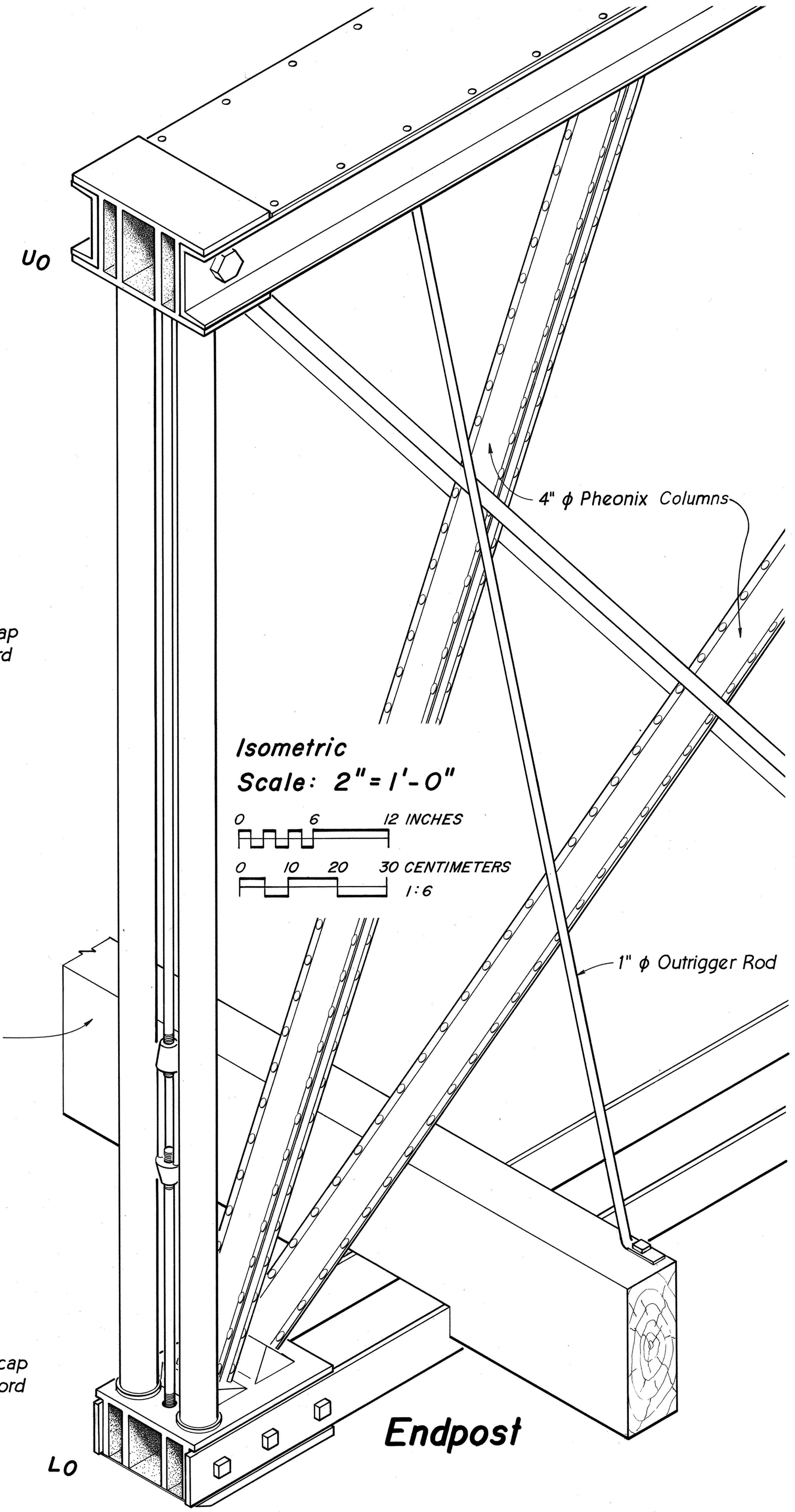
Elevation L2

Endpost Elevation U0





Endpost Elevation L0



Isometric
Scale: 2" = 1'-0"
0 6 12 INCHES
0 10 20 30 CENTIMETERS
1:6

Endpost

HISTORIC AMERICAN ENGINEERING RECORD
MA – 17
SHEET 3 of 3

ATHERTON BRIDGE (BOLTON ROAD BRIDGE) - 1870
Spanning the Nashua River on Bolton Road
LANCASTER WORCESTER COUNTY MASSACHUSETTS

DELINEATED BY: PAT REESE, 1990
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