NPS Form 10-900
(3-82)

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United States Department of the Interior
National Park Service

National Register of Historic Places Inventory—Nomination Form

For NPS use only
received APR 2 8 1987
date entered JUN 12 1987

See instructions in *How to Complete National Register Forms*
Type all entries—complete applicable sections

1. Name

historic N/A

and/or common MOVABLE ~~RAILROAD BRIDGES ON THE NORTHEAST CORRIDOR~~ IN CONNECTICUT THEMATIC RESOURCE

2. Location

street & number See individual forms ___ not for publication

city, town ___ vicinity of

state code county code

3. Classification

Category	Ownership	Status	Present Use	
___ district	___ public	_X_ occupied	___ agriculture	___ museum
___ building(s)	___ private	___ unoccupied	___ commercial	___ park
___ structure	_X_ both	___ work in progress	___ educational	___ private residence
___ site	**Public Acquisition**	**Accessible**	___ entertainment	___ religious
___ object	___ in process	_X_ yes: restricted	___ government	___ scientific
THEMATIC	___ being considered	___ yes: unrestricted	___ industrial	_X_ transportation
RESOURCE	N/A	___ no	___ military	___ other:

4. Owner of Property

name National Railroad Passenger Corporation (AMTRAK)

street & number Harold R. Henderson, General Counsel
400 North Capitol Street

city, town Washington N/A vicinity of state DC (continued)

5. Location of Legal Description

courthouse, registry of deeds, etc. Rail Operations
Connecticut Department of Transportation

street & number 24 Wolcott Hill Road

city, town Wethersfield state CT

6. Representation in Existing Surveys

title Northeast Corridor Aerial Reconnaissance of Historic Structures has this property been determined eligible? 7 November 1977 _X_ yes ___ no

date 1977 _X_ federal ___ state ___ county ___ local

depository for survey records Federal Railroad Administration
2100 2nd Street SW- Room 4613

city, town Washington state DC

7. Description

Condition		Check one	Check one
___ excellent	___ deteriorated	___ unaltered	X original site
X good	___ ruins	X altered	___ moved date _____
X fair	___ unexposed		

Describe the present and original (if known) physical appearance

The thematic resource described in this inventory-nomination form consists of eight movable railroad bridges which are part of the Northeast Corridor rail route along the shoreline of Connecticut. The bridges range in date from 1896 to 1918, and all are of steel construction. The five westernmost of the bridges are on a four-track electrified route, and the three east of New Haven are double-tracked and non-electric.

The bridges provide rail crossings across the navigable rivers which form part of the numerous harbors along the shoreline. The setting of the bridges varies with the size of the locality, but typically it is a mixture of light industry; restaurants and other commercial uses; and docks, marinas, and boat-launch areas. In every case, there is a nearby parallel highway crossing; most are high-level modern bridges, but two are movable highway bridges which are of historic interest in their own right.

In every case, the bridges consist of two or more approach spans, often carried over shallow water or tidal flats, and a movable span which crosses the navigation channel. The approach spans include a variety of types: deck trusses, through trusses, and deck girders. The movable spans include one swing span and seven bascules, of which six are the Scherzer rolling lift variety. The seventh is a Strauss heel-trunnion design. The superstructures of the movable spans include deck-girder, through-girder, deck-truss, and through-truss designs; all bascule-span trusses are Warren-type with verticals. Length of the movable spans varies from 69' to 202'. Construction is primarily riveted, though there are some pin-connected approach-span trusses. Some of the approach spans were built as part of earlier bridges.

Abutments and piers are of granite-ashlar construction, usually resting on concrete footings. One bridge (Niantic) has the circular pivot pier from an earlier swing bridge nearby. Bridges include a small control house, usually a hip-roof, steel-framed structure cantilevered off one side of the bridge.

The bridges were all built as part of a massive turn-of-the-century improvement project carried out by the New York, New Haven & Hartford Railroad. Today the line is owned by AMTRAK and the State of Connecticut and carries, in addition to long-distance passenger trains, the commuter traffic of Metro-North between New Haven and New York and the freight traffic of CONRAIL. The bridges were engineered by railroad staff engineers and erected by outside bridge companies, principally American Bridge Company. The bascule spans were engineered by the companies holding the proprietary designs.

(continued)

Property Owners (continued):

The three bridges east of New Haven are privately owned by AMTRAK (address on cover). The five west of New Haven are publicly owned by:

State of Connecticut
Department of Transportation, J. William Burns, Commissioner
24 Wolcott Hill Road
Wethersfield, Connecticut 06109

Representation in Existing Surveys (continued):

State Register of Historic Places State-1986
Records deposited with Connecticut Historical Commission
59 South Prospect Street
Hartford, Connecticut 06106

Connecticut: An Inventory of Historic Engineering and Industrial Sites.

Federal/State-1981 Historic American Engineering Record

Records deposited with Connecticut Historical Commission
59 South Prospect Street
Hartford, Connecticut 06106

Description (continued):

With one exception, the bridges today appear in at least fair condition, and all are believed to be structurally adequate.* Many are presently undergoing tie and/or rail replacement, and three were structurally, mechanically, and electrically upgraded around 1980 as part of the Northeast Corridor Improvement Project. The five westernmost bridges are in need of electrical and mechanical modernization, and the state is planning structural repair with individual member-for-member replacement of deteriorated parts. Pequabuck Bridge is presently inoperable; in addition to inadequate mechanical and electrical systems, the bridge's piers are in need of attention. Most control houses, originally sided with metal panels, have been redone with vinyl siding and small-pane windows. The bridges continue to possess integrity of design, setting, and materials: despite some reinforcement, the superstructures are largely original, and drive gears and chains, if not original, are largely similar replacements in kind.

Survey Methodology

The movable railroad bridges in this thematic resource were identified in a reconnaissance survey of historic and archeological resources undertaken in 1977 as part of the Northeast Corridor Improvement Project. The Federal Railroad Administration, U.S. Depratment of Transportation, sponsored the survey, which was prepared by the firm of DeLeuw, Cather/Parsons of Washington, D.C. Inventoried buildings, structures, and sites are described in a Department of Transportation Technical Report entitled Historic and Archeological Resources of the Northeast Corridor: Connecticut (1979). Survey personnel were M.F. Rupp, project director; J.G. Artemel, principal investigator, A.E. Baggerman, cultural resources planner; K.K. Heintz, cultural resources planner; and A.H. Muego, archeologist.

The survey incorporated sites previously identified by state and federal agencies as well as sites inventoried as a result of aerial and ground-level inspection of the rail line and its environs. The entire shoreline route, from Greenwich to Stonington, was included in the survey. Potential archeological sites were identified through reports of artifact discoveries and topographical configuration; no subsurface testing was done. Because this nomination is limited by its theme to one particular type of engineering structure, the lack of subsurface archeological testing does not affect its comprehensiveness.

The survey identified all historic buildings, structures, and sites which appeared to have some potential National-Register eligibility. The Federal Railroad Administration sought Determinations of Eligibility for sites affected by project improvements, including all the bridges in this group. Two movable railroad bridges identified in the survey (Shaw's Cove, New London, and Mystic River, Groton-Stonington) have been demolished; all

*Remarks of Richard P. Rathbun, Assistant Director, Rail Operations, Connecticut Department of Transportation, and David W. Jacobs, assistant Director, Structural Engineering, Metro-North, before the State Historic Preservation Board, March 5, 1986.

Description (continued):

others are included in this nomination.

The inventory-nomination forms prepared as part of the Determination of Eligibility process have been used as the individual forms in this nomination. Each site was inspected and photographed by the preparers of the nomination. Additional description has been provided to account for changes since 1977, when the forms were originally prepared. UTM coordinates and ownership information were rechecked and corrected as needed, and minor editorial changes were made as appropriate. New photographs from 1986 accompany the forms.

The railroad bridges included in the thematic resource are listed below, from west to east:

Mianus River (Cos Cob), Greenwich, 1904, Scherzer deck-girder bascule (Photographs # 1 and 2)

Norwalk River, Norwalk, 1896, double-intersection Warren deck-truss swing bridge (Photographs #3 and 4)

Saugatuck River, Westport, 1905, Scherzer deck-girder bascule (Photographs #5 and 6)

Pequonnock River, Bridgeport, 1902, Scherzer through-girder bascule (Photograph #7)

Housatonic River (Devon), Stratford-Milford, 1905, Scherzer Warren through-truss bascule (Photograph #8)

Connecticut River, Old Saybrook-Old Lyme, 1907, Scherzer Warren through-truss bascule (Photographs #9 and 10)

Niantic River, East Lyme-Waterford, 1907, Scherzer through-girder bascule (Photographs #11 and 12)

Thames River (Groton), 1919, Strauss heel-trunnion Warren through-truss bascule (Photograph #13)

8. Significance

Period	Areas of Significance—Check and justify below				
___ prehistoric	___ archeology-prehistoric	___ community planning	___ landscape architecture	___ religion
___ 1400–1499	___ archeology-historic	___ conservation	___ law	___ science
___ 1500–1599	___ agriculture	___ economics	___ literature	___ sculpture
___ 1600–1699	___ architecture	___ education	___ military	___ social/ humanitarian
_X_ 1700–1799	___ art	X engineering	___ music	
_X_ 1800–1899	___ commerce	___ exploration/settlement	___ philosophy	___ theater
___ 1900–	___ communications	___ industry	___ politics/government	_X_ transportation
		___ invention		___ other (specify)

Criteria A,C

Specific dates See forms **Builder/Architect** See individual forms

Statement of Significance (in one paragraph)

Summary

The eight movable bridges in the thematic group are significant because they illustrate the historical development of Connecticut's most important rail corridor, the shoreline route of the New York, New Haven & Hartford Railroad (Criterion A). The New Haven, as it was known, was one of the busiest freight and passenger carriers in the nation and had a near monopoly on Connecticut rail traffic. The bridges are substantial works of engineering which were essential to a massive turn-of-the-century upgrading of the line, an improvement project which involved adding more parallel tracks, eliminating grade crossings, and re-aligning curves. The bridges are also important because they embody the distinctive characteristics of turn-of-the-century movable railroad bridges (Criterion C). They are typical of the period in their use of steel; their riveted joints and heavy structural members; and their designs, which include three of the period's leading types of drawbridges: the swing bridge, the Scherzer rolling-lift bascule, and the Strauss bascule.

Historical Development

The New York, New Haven & Hartford Railroad was formed in 1872 as a result of a merger of the New York & New Haven and the Hartford & New Haven railroads, first-generation rail companies which had built their routes in the 1830s and 1840s. The New Haven railroad acted as New England's gateway: its lines served the populous area between Boston and New York and provided freight service to the highly industrialized southern New England region. Through acquisitions and long-term leases, the New Haven had taken control by 1898 of nearly every rail line in Connecticut and adjacent parts of Massachusetts and Rhode Island.

The segment between New York and New Haven was the railroad's most important route. Two major Boston-to-New York passenger lines joined in New Haven and followed the coastal route for their final leg of the trip to New York. In 1889, with the completion of the first bridge over the Thames River, a third route via Providence and the eastern Connecticut shore was added; the shoreline route soon became the major passenger corridor between the two metropolises. To this was added substantial freight and passenger traffic from connecting north-south railroad lines.

To handle the ever-increasing traffic, the New Haven in the 1890s began a substantial re-building of its shoreline route. From New Haven to New York, the right-of-way was expanded to carry four parallel tracks, and east of New Haven the line was double-tracked. At the same time, grade crossings were largely eliminated by elevating the line, and several sections were re-aligned.

(continued)

9. Major Bibliographical References

See continuation sheet

10. Geographical Data

Acreage of nominated property See individual forms

Quadrangle name See individual forms **Quadrangle scale** 1:24000

UTM References See individual forms

	Zone	Easting	Northing
A			
B			
C			
D			
E			
F			
G			
H			

Verbal boundary description and justification

See individual forms

List all states and counties for properties overlapping state or county boundaries See continuation sheet

state	code	county	code
state	code	county	code

11. Form Prepared By

name/title Bruce Clouette and Matthew Roth, edited by John Herzan, National Register Coordinator

organization Historic Resource Consultants **date** February 4, 1986

street & number The Colt Armory 55 Van Dyke Avenue **telephone** (203) 547-0268

city or town Hartford **state** Connecticut

12. State Historic Preservation Officer Certification

The evaluated significance of this property within the state is:

___ national ___X___ state ___ local

As the designated State Historic Preservation Officer for the National Historic Preservation Act of 1966 (Public Law 89-665), I hereby nominate this property for inclusion in the National Register and certify that it has been evaluated according to the criteria and procedures set forth by the National Park Service.

State Historic Preservation Officer signature

title Director, Connecticut Historical Commission **date** April 13, 1987

For NPS use only

I hereby certify that this property is included in the National Register

Patrick Andrus **date** 6/12/87

for **Keeper of the National Register**

Attest: **date**

Chief of Registration

GPO 894-765

Significance (continued):

The drawbridges which make up the thematic resource were an essential part of the improvements. Existing bridges were mostly single-track swing bridges constructed in the 1870s and 1880s of timber or wrought iron. These were inadequate: their single-track width caused lengthy delays when more than one train approached at the same time; they were too lightly constructed for heavier turn-of-the-century steam engines and rolling stock; and they were slow to operate. Because of dimensional, structural, and signaling inadequacies, the state Railroad Commissioners had imposed stop-and-wait procedures and speed restrictions on most of the New Haven's movable bridges.

The bridges included in the thematic group solved the New Haven's problems. Heavily built of steel, using rigid riveted construction, they were structurally capable of supporting the heaviest and fastest trains foreseeable at the time. Because they were the same width as the main line, no cross-overs or waiting for clearance delayed trains, and improved signaling and interlocks provided additional safety. The use of bascules for all but the earliest rebuilt bridge made for faster operating times and thus fewer delays for navigation. Moreover, the bascules allowed for subsequent expansion through parallel bridges, an intent obvious east of New Haven, where piers and abutments were made wide enough for two additional tracks (never built). In 1907, the Railroad Commissioners lifted all speed and other restrictions on the New Haven's shoreline bridges.

Technology of Movable Bridges

The 1890s were a period of intense development of movable bridges. Prior to that time, most were of the swing-bridge type represented by the Norwalk River bridge, built in 1896 and the earliest bridge in the thematic resource. In its wide proportions and heavy steel construction, the Norwalk bridge exemplifies the railroad swing bridge at its height of development: after the mid-1890s, nearly all movable bridges were bascules of one type or another. Swing bridges underwent little further evolution, except for the development of center-bearing rather than rim-bearing designs. Although they were relatively inexpensive to construct, operate, and maintain, they became increasingly rare for larger railroad bridges after 1900.

Bascules had several advantages over swing bridges: they provided a single wide channel rather than two narrow ones; they had no center pier to cause riverbank erosion; they opened quickly and they could be partially opened for small boats, thus speeding up operations; and they allowed for future expansion. During the 1890s and early 1900s, many innovations for bascules and associated machinery were patented, spurred on in part by Chicago's elevated railways and municipal public works department, which attempted to modernize all the drawbridges in the city.

(continued)

Significance (continued):

Among the most important designs was the rolling lift bridge invented by William Scherzer of Chicago. The essence of his patent was that the bascule, instead of pivoting on a fixed trunnion at one end, rolled back on huge arched girders which moved along a track. There were many variations possible in the arrangement of counterweights (above or below grade); drive train (both shaft and chain driven arrangements are represented in the thematic resource); and superstructure. Plate-girder superstructures sufficed for the shorter spans, while the longer spans were through-trusses. The advantages of the Scherzer design were fast operation; low energy consumption; simplified maintenance and repair, since there were no high-stress pivot points; and greater channel clearance, since the bridge moved back from the channel as it was opened. The six Scherzer bascules in the thematic resource were built within fifteen years of the design's first appearance. Pequonnock (1902) was described in detail in the engineering periodicals of its day, [1] and three others were cited in a standard engineering text of the period.

The 158' Connecticut River bascule approaches the practical length limit for the Scherzer design. Beyond a certain point, the shifting forces exerted on the pier by the huge rolling arcs became excessive. For longer bridges, such as the Thames River bridge (188'), the Strauss bascule was more appropriate. First patented in 1905, the essence of the Strauss design was the use of a separate structure for the counterweight; in the Thames River bridge, the counterweight structure is appended to the end of an adjacent fixed span. An operating strut pulls back on the bridge and thereby rotates the counterweight's rocking truss, which is connected to the upper corner of the bascule truss by a linkage arm. The bascule moves on a pivot called a heel trunnion. Although the design sacrificed the economy and simplicity inherent in the Scherzer bascule, it minimized horizontal forces on the piers, an especially important consideration where piers had to be sunk through deep glacial sediment (bedrock was 197' below the bottom of the Thames). Hovey's textbook used the Thames River bridge as a case study for the Strauss heel-trunnion design.[2]

The bridges for the most part have the typical heavy steel riveted construction which characterized turn-of-the centry railroad bridges. The large size of the members reflects the increased loadings presented by the steam engines of the period. By 1895, steel had eclipsed wrought iron for use in railroad bridges, and riveted joints won favor over pinned connections because of their greater rigidity and simplified design and fabrication. However, some of the approach spans for the Housatonic River bridge and the Connecticut River bridge are pin-connected trusses. The pinned spans have separate significance as relatively rare examples (for Connecticut) of that earlier type of construction.

(continued)

Significance (continued):

The Thematic Group

The component resources constitute a logical finite group, since they include all the similar structures (movable bridges) on a particular railroad route within the state of Connecticut. Other related resources may exist on the former New Haven line in New York. These would fall within the historical and technological themes outlined above, since they would probably be structurally similar and related to the growth of the New Haven Railroad. The limitation of the resources to Connecticut reflects the program responsibilities of the Connecticut State Historic Preservation Officer. Other railroad routes have not been systematically surveyed; at least one other railroad swing bridge (Connecticut River, Middletown/Portland) and one street-railway swing bridge (Pleasure Beach, Bridgeport) are known to exist; however, they do not sustain the theme of the historical development of the New Haven's main route. The resource excludes movable highway bridges because such bridges were designed for a different set of engineering requirements and they do not relate to the historical theme.

The survey and inventory process on which the nomination is based has been integrated into the state planning process through the review activities of the Connecticut Historical Commission, which comments on federal and state-funded projects affecting sites listed on or eligible for the State Register of Historic Places and/or the National Register of Historic Places. The structures in this thematic group have all been determined eligible for the National Register.

Notes:

1. Otis E. Hovey, Movable Bridges (2 vols. New York: John Wiley & Sons, 1926), I, 109.

2. Ibid., 125-128.

Bibliography (continued):

Connecticut Railroad Commissioners. Annual Report, 1902-1919.

Hool, George A. and W.S. Kinne. Movable and Long-Span Steel Bridges. New York: McGraw-Hill Book Company, 1923.

Hovey, Otis E. Movable Bridges. 2 vols. New York: John Wiley & Sons, 1926.

"Pequonnock River Railroad Bridge." Railroad Gazette 38 (March 17, 1905).

"Scherzer Rolling-lift Plate Girder Railroad Bridges." Engineering Record 48, no. 2 (July 11, 1903): 39-40.

Soehrens, J.H. "Connecticut River Railroad Bridge at Lyme," Connecticut Society of Civil Engineers Proceedings, 1907, p. 87.

Spencer, P. B. "The Proposed Thames River Railroad Bridge at New London, Connecticut." Connecticut Society of Civil Engineers Proceedings, 1916, 120-26.

NPS Form 10-900-a
(8-86)

OMB Approval No. 1024-0018

4/28/87

United States Department of the Interior
National Park Service

National Register of Historic Places Continuation Sheet

Section number _____ **Page** _____

Multiple Resource Area
Thematic Group

Name Movable Railroad Bridges on the NE Corridor in Connecticut TR
State Fairfield County and others, CT

Nomination/Type of Review		Date/Signature
Cover Substantive Review	for Keeper	Patrick Andrus 6/12/87
1. Housatonic River Railroad Bridge Entered in the National Register	Keeper	Joyce M. McPherson 6/12/87
	Attest	
2. Mianus River Railroad Bridge Entered in the National Register	Keeper	Joyce M. McPherson 6/12/87
	Attest	
3. Norfolk River Railroad Bridge Entered in the National Register	Keeper	Joyce M. McPherson 6/12/87
	Attest	
4. Pequonnock River Railroad Bridge Entered in the National Register	Keeper	Joyce M. McPherson 6/12/87
	Attest	
5. Saugatuck River Railroad Bridge Entered in the National Register	Keeper	Joyce M. McPherson 6/12/87
	Attest	
6. Connecticut River Railroad Bridge DOE/OWNER OBJECTION Substantive Review	for Keeper	Patrick Andrus 6/12/87
	Attest	Beth Savage 6/12/87
7. Niantic River Railroad Bridge DOE/OWNER OBJECTION Substantive Review	for Keeper	Patrick Andrus 6/12/87
	Attest	Beth Savage 6/12/87
8. Thames River Railroad Bridge DOE/OWNER OBJECTION Substantive Review	for Keeper	Patrick Andrus 6/12/87
	Attest	Beth Savage 6/12/87
9.	Keeper	
	Attest	
10.	Keeper	
	Attest	