United States Department of the Interior
National Park Service

National Register of Historic Places Continuation Sheet

Section number ______ Page ______

SUPPLEMENTARY LISTING RECORD

NRIS Reference Number: 04001093 Date Listed: 9/29/04

Washington Bridge	New Haven	CT
Property Name	**County**	**State**

N/A
Multiple Name

This property is listed in the National Register of Historic Places in accordance with the attached nomination documentation subject to the following exceptions, exclusions, or amendments, notwithstanding the National Park Service certification included in the nomination documentation.

Entered in the National Register

Signature of the Keeper

9-29-04
Date of Action

Amended Items in Nomination:

8. Statement of Significance: Period of Significance:

The period of significance for this property's historical and engineering significance under criteria A and C is 1921.

This was confirmed with CTSHPO staff by telephone.

DISTRIBUTION:
- National Register property file
- Nominating Authority (without attachment)

NPS Form 10-900
(Oct. 1990)

OMB No. 10024-0018

16

United States Department of the Interior
National Park Service

National Register of Historic Places Registration Form

This form is for use in nominating or requesting determinations for individual properties and districts. See instructions in *How to Complete the National Register of Historic Places Registration Form* (National Register Bulletin 16A). Complete each item be marking "x" in the appropriate box or by entering the information requested. If an item does not apply to the property being documented, enter "N/A" for "not applicable". For functions, architectural classification, materials, and areas of significance, enter only categories and subcategories from the instructions. Place additional entries and narrative items on continuation sheets (NPS Form 10-900a). Use a typewriter, word processor, or computer to complete all items.

1. Name of Property

historic name WASHINGTON BRIDGE

other names/site number Bridge No. 327

2. Location

street & number Route 1 at Housatonic River ☐ not for publication

city or town Milford - Stratford ☐ vicinity

state Connecticut code CT county New Haven - Fairfield code 009, 001 zip code 06460,06614

3. State/Federal Agency Certification

As the designated authority under the National Historic Preservation Act, as amended, I hereby certify that this ☒ nomination ☐ request for determination of eligibility meets the documentation standards for registering properties in the National Register of Historic Places and meets the procedural and professional requirements set forth in 36 CFR Part 60. In my opinion, the property ☒ meets ☐ does not meet the National Register criteria. I recommend that this property be considered significant ☐ nationally ☒ statewide ☐ locally. (☐ See continuation sheet for additional comments.)

08/10/04

Signature of certifying official/Title Date

J. Paul Loether, Division Director, Connecticut Commission on Culture & Tourism
Deputy State Historic Preservation Officer

State or Federal agency and bureau

In my opinion, the property ☐ meets ☐ does not meet the National Register criteria. (☐ See continuation sheet for additional comments.)

Signature of certifying official/Title Date

State or Federal agency and bureau

4. National Park Service Certification

I hereby certify that the property is:

☒ entered in the National Register.
☐ See continuation sheet.
☐ determined eligible for the National Register.
☐ See continuation sheet.
☐ determined not eligible for the National Register.
☐ removed from the National Register.
☐ other, (explain): ______

Signature of the Keeper

Entered in the National Register

Date of Action

9-29-04

5. Classification

Ownership of Property
(Check as many boxes as apply)

- ☐ private
- ☐ public-local
- ■ public-State
- ☐ public-Federal

Category of Property
(Check only one box)

- ☐ building(s)
- ☐ district
- ☐ site
- ■ structure
- ☐ object

Number of Resources within Property
(Do not include previously listed resources in the count)

Contributing	Noncontributing	
		buildings
		sites
1		structures
		objects
1	0	Total

Name of related multiple property listing
(Enter "N/A" if property is not part of a multiple property listing.)

N/A

Number of contributing resources previously listed in the National Register

0

6. Function or Use

Historic Functions
(Enter categories from instructions)

TRANSPORTATION: road-related

Current Functions
(Enter categories from instructions)

TRANSPORTATION: road-related

7. Description

Architectural Classification
(Enter categories from instructions)

Other: open-spandrel concrete arch
Other: simple-trunnion deck-truss bascule
Late 19th and 20th Century Revivals

Materials
(Enter categories from instructions)

foundation N/A
walls N/A
roof N/A
other N/A

Narrative Description
(Describe the historic and current condition of the property on one or more continuation sheets.)

Washington Bridge
Name of Property

New Haven - Fairfield Counties, CT
County and State

8. Statement of Significance

Applicable National Register Criteria
(Mark an "x" in one or more boxes for the criteria qualifying the property for National Register listing.)

■ **A** Property is associated with events that have made a significant contribution to the broad patterns of our history.

☐ **B** Property is associated with the lives of persons significant in our past.

■ **C** Property embodies the distinctive characteristics of a type, period, or method of construction or represents the work of a master, or possesses high artistic values, or represents a significant and distinguishable entity whose components lack individual distinction.

☐ **D** Property has yielded, or is likely to yield, information important in prehistory or history.

Criteria Considerations
(Mark "x" in a ll the boxes that apply.)

Property is:

☐ **A** owned by a religious institution or used for religious purposes.

☐ **B** removed from its original location.

☐ **C** a birthplace or grave.

☐ **D** a cemetery.

☐ **E** a reconstructed building, object, structure

☐ **F** a commemorative property.

☐ **G** less than 50 years of age or achieved significance within the past 50 years.

Areas of Significance
(Enter categories from instructions)

ENGINEERING
TRANSPORTATION

Period of Significance
1915-1935

Significant Dates
1921

Significant Person
(Complete if Criterion B is marked above.)
N/A

Cultural Affiliation

Architect/Builder
Connecticut Highway Department, engineers
Waddell & Son, bascule design
T. Stuart and Son, contractor

Narrative Statement of Significance
(Explain the significance of the property on one or more continuation sheets.)

9. Major Bibliographic References

Bibliography
(Cite the books, articles, and other sources used in preparing this form on one or more continuation sheets.)

Previous documentation on file (NPS):

☐ preliminary determination of individual listing (36 CFR 67) has been requested
☐ previously listed in the National Register
☐ previously determined eligible by the National Register
☐ designated a National Historic Landmark
☐ recorded by Historic American Building Survey # ______
☐ recorded by Historic American Engineering Record # ______

Primary location of additional data:

■ State Historic Preservation Office
☐ Other State agency
☐ Federal agency
☐ Local government
☐ University
☐ Other

Name of repository:

Connecticut Historical Commission,
59 South Prospect Street, Hartford, CT 06106

10. Geographical Data

Acreage of Property less than one

UTM References
(Place additional UTM references on a continuation sheet.)

	Zone	Easting	Northing		Zone	Easting	Northing
1	18	658400	4562490	3			
2				4			

☐ See continuation sheet

Verbal Boundary Description
(Describe the boundaries of the property on a continuation sheet.)

Boundary Justification
(Explain why the boundaries were selected on a continuation sheet.)

11. Form Prepared By

name/title Bruce Clouette, Historian

organization Public Archaeology Survey Team, Inc. date March 31, 2003

street & number P.O. Box 209 telephone 860-429-1723

city or town Storrs state CT zip code 06268

Additional Documentation

Submit the following items with the completed form:

Continuation Sheets

Maps
A **USGS map** (7.5 or 15 minute series) indicating the property's location.
A **Sketch map** for historic districts and properties having large acreage or numerous resources.

Photographs
Representative **black and white photographs** of the property.

Additional Items
(Check with SHPO or FPO for any additional items.)

Property Owner
(Complete this item at the request of SHPO or FPO.)

name Connecticut Department of Transportation

street & number 2800 Berlin Turnpike telephone 860-594-3000

city or town Newington state CT zip code 06141-7546

Description:

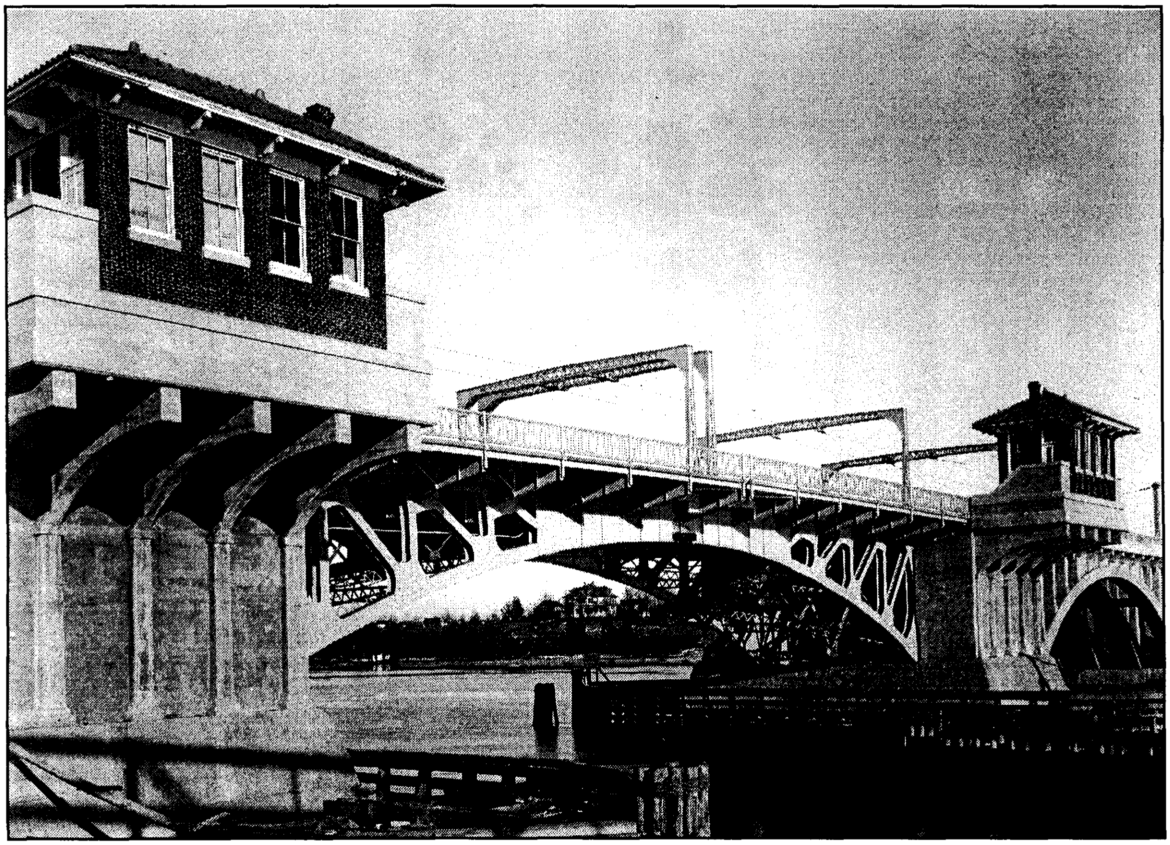
The Washington Bridge (Photographs 1 and 2) carries Route 1 across the Housatonic River, the dividing line between the towns of Milford and Stratford and between New Haven and Fairfield counties. The bridge consists of five 100-foot-long open-spandrel concrete arches and a double-leaf bascule that is 151 feet long. Counting the three concrete-girder approach spans at each end, the bridge has an overall length of 859 feet. The roadway is 43 feet wide, and there are sidewalks along both sides of the bridge; originally, the bridge also carried two tracks for streetcar traffic. The setting is generally one of commercial use, with large pleasure-boat marinas on either side of the river.

The bridge's open-spandrel arches (Photograph 3) each consist of six parallel ribs, tapering from 5 feet in depth at the springing points to 2 ½ feet at the apex; the outer ribs are 4 feet wide and the four center ribs are 6 feet wide. The rise of the arches varies from 19 to 24 feet to create an overall crown to the bridge. Within each arch the ribs are joined by two cross-ties measuring 1 foot by 3 feet in section. Large columns rise from the ribs to support cross-beams for the concrete-slab deck; the columns on top of the outer ribs measure 15 inches by 36 inches in section, while those atop the center four ribs are 15 inches by 48 inches in section. The deck is wider than the arches and so is cantilevered out on the ends of the floor beams, which are treated as coved brackets. The openings between the columns are given a round-arched shape, an ornamental effect continued between the columns that support the girder approach spans.

The double-leaf bascule (Photograph 4) provides a channel width of 125 feet. Structurally the bascule leaves can be regarded as two five-panel arched Pratt deck trusses in which the four panels over the channels, that is, at the ends of the leaves, have plate webs; the trusses are extensively cross-braced on the underside. The simple-trunnion undergrade-counterweight design features large box-girders that act as axles for the bascule's trunnions. The counterweights are concrete and steel masses fixed to the heels of the leaves. The bridge is operated by electrical motors; a series of reduction gears carries the power to pinions which engage large segmental curved gears attached to the leaves. When closed, toe locks secure the ends of the two leaves together.

The reinforced-concrete piers and abutments are faced with an ashlar of quarry-faced stone. The piers at the ends of the bascule, which are mostly hollow to accommodate the counterweights, are substantially larger than the others. On the south side, large coved brackets support two deck houses that are completely cantilevered out from the structure itself. The deck houses feature red-brick walls, bracketed cornices, and tile roofs (Photograph 5). Originally, one housed the controls for bridge operation and the other was a public restroom, but the latter is now used or storage. A bronze plaque gives the bridge's date and the particulars of the project participants (Photograph 6). A modern guardrail, installed in 1989, consists of metal tubular rails atop a concrete parapet, which features round-arched panels on its outer surface to suggest the appearance of the original railing, a balustrade-type with round-arched openings. The bascule portion originally had railings of decorative ironwork.

View of bascule span shortly after completion in 1921 (Connecticut Department of Transportation Photo Archives).



Next page: "Proposed Highway Bridge Over Housatonic River," February 17, 1919, Connecticut Highway Department. Note that, as built, the comfort station and operator's house were placed on the south side of the bridge, and the operator's house was on the west bascule pier.

Statement of Significance:

Summary

The Washington Bridge has two components to its engineering significance (Criterion C): it is a notable example of movable-bridge engineering that illustrates the highly refined bascule designs developed in the early 20th-century, and in its five 100-foot spans it embodies the distinctive characteristics of the open-spandrel arch, which in many ways was the epitome of reinforced-concrete bridge engineering. Bascules were developed around the turn of the 20th century as an alternative to the swing bridges that had prevailed previously. Bascules offered faster operating times, provided a single wide channel rather than two narrower ones, and could be widened with a parallel bridge if necessary. Although in basic principle similar to medieval drawbridges, these bascules incorporated numerous mechanical-engineering innovations that made them practical for the needs of their time. The Washington Bridge's bascule was designed by the firm of Waddell and Son, which included John A. L. Waddell, author of numerous turn-of-the-century treatises on bridge design.

The fixed spans of the Washington Bridge also illustrates both the practical and aesthetic possibilities of the open-spandrel arch design. By reducing the dead load of the bridge to only that which was created by the essential structural members, the open-spandrel design saved a great deal of material and relieved the weight bearing down on the bridge's piers. In a case like this, where piles had to be driven through thick sediment in the bed of a tidal river, the open-spandrel design allowed the engineers to maximize the distance between piers and keep the size of the piers to a minimum. The repetition of the arched shape, especially when combined with the arched-truss leaves of the bascule portion, was also highly valued by the bridge's creators, who regarded the bridge as an artistic as well as an engineering accomplishment.

The Washington Bridge is historically important as the first large bridge project completed by the Connecticut Highway Department, predecessor agency to today's Department of Transportation. When the Department was given authority over Trunk Line bridges in 1915, the Department's engineers immediately turned their attention to the state's busiest corridor, the shore line route just inland from Long Island Sound known today as Route 1 or the Boston Post Road. Once World War I ended, construction began on this bridge and was completed in 1921. At the time it was regarded as a showpiece of the Department's expertise, and today it serves as a highly visible reminder of an important episode in Connecticut's transportation history, the beginnings of the state-highway system in the early 20th-century (Criterion A).

Engineering Significance

The Washington Bridge embodies two distinctive developments in early 20th-century bridge engineering: bascule-type movable bridges and open-spandrel concrete arches. Bascules, similar in concept to the drawbridges that are popularly associated with medieval castle moats, underwent substantial refinement in the 1890s and early 1900s, first in Chicago and then in densely built areas throughout the country. The Washington Bridge's bascule is classified as a "simple trunnion" design, in which the leaf is balanced by a fixed counterweight attached to the end, with the leaf rotating on a large pivot or trunnion at the center of gravity. Such a design was relatively uncomplicated and was economical where the height of the bridge allowed the counterweight to move through an arc that did not take it below the waterline (otherwise, a water-tight counterweight compartment was needed, or a more complex movement for the counterweight). In addition to the considerations enumerated in the summary paragraph, bascules had the advantages that they could be built very wide without incurring exceptional difficulties, and they eliminated the navigational hazards posed by the swing bridge's upstream and downstream rest piers.

The contract for the design of the bascule portion was given to Waddell & Son of New York City, a firm in which John Alexander Low Waddell (1854-1938) was a principal. In addition to his activities as a consulting engineer, J. A .L. Waddell wrote some of the best known engineering treatises of his period: *De Pontibus: A Pocketbook for Bridge Engineers* (1898), *Bridge Engineering* (1916), and *Economics of Bridgework* (1921). He used the Washington Bridge as an example of the calculation of construction costs in *Economics of Bridgework*, an example that indicates that a vertical-lift bridge was at least considered as an option instead of a bascule. In his article on the Washington Bridge written for the *Proceedings* of the Connecticut Society of Civil Engineers, Deputy State Highway Commissioner Richard L. Saunders described the bascule as a "Brown type." Although the bridge does not embody any of the specific bascule patents held by Thomas E. Brown, the mention of his name suggests that Waddell involved him in the design as a subconsultant. Brown (1854-1922) spent most of his professional life as a mechanical engineer with the Otis Elevator Company and was responsible for designing the inclined elevators installed in the Eiffel Tower's legs in 1888. Later in life, he turned his attention to bascules and came up with a number of intricate arrangements, particularly with regard to counterweight movement. J. A. L. Waddell praised his designs repeatedly in *Economics of Bridgework*, so it is not surprising that he would involve this eminent engineer in the design of Washington Bridge.

Even without its bascule portion, the Washington Bridge would rank as one of the state's leading early 20th-century works of engineering because of its five 100-foot open-spandrel concrete arches. Compared with the solid or filled-spandrel design, the open-spandrel type was more complex to engineer and involved much more form work to construct. However, it was economical for long spans because of the savings in weight, which not only reduced material costs but also allowed the various parts of the bridge to be built to carry a smaller dead load. This was a particularly important consideration with the piers and abutments, which had to be constructed on piles sunk through thick layers of sediment at the bottom of the river. By reducing the main load-bearing component to thin arch ribs and replacing the spandrel fill with a system of columns and floor beams, the open-spandrel design minimized the load represented by the structure itself. It also lent the bridge a light and airy appearance, an aesthetic benefit that state engineers repeatedly cited. Although its arches are not the longest in the state, its overall length makes it the largest of the six open-spandrel bridges remaining in Connecticut.

Reinforced-concrete was a relatively new material when the State Highway Department recommended it as the first choice for bridges in 1907. The engineers liked concrete because it was relatively inexpensive. Consisting of sand, gravel, Portland cement and water, its only costly material component was the steel reinforcement that gave it tensile strength. Also, concrete bridges could be built by local contractors using ordinary labor and the carpentry and masonry skills found in any large community. It had tremendous strength and so could be expected to handle whatever demands would arise in the future. Finally, concrete was thought to be impervious to the environmental conditions that affected wooden and metal bridges and so were expected to last a very long time, perhaps indefinitely.*

Historical Significance

Prior to the 20th century, Connecticut's state government played only the most minor role in initiating or funding transportation improvements. Towns were responsible for highways and bridges, and in the case of a bridge that spanned a river dividing two towns, both towns had to agree on its specifications and cost. A few large bridges were built and operated by specially chartered private companies that were given the right to charge a toll for passage. In 1895 the Legislature created a Highway Commission to assist towns with projects that would improve farmers' access to markets, such as surfacing roads with packed gravel, installing drainage, and eliminating steep hills. A total of $75,000 was appropriated, with the average grant totaling less than $900. Two years later the Highway Commission was authorized to employ a small professional staff, thereby creating the State Highway Department. At first, the state engineers merely played an advisory role helping towns with their projects. In 1905, however, the Legislature created the Trunk-Line System, designating fourteen major roads that thenceforth would be improved and maintained directly by the State Highway Department. By this time it had become clear that the growing numbers of automobiles in the state and the increased shipping of goods by truck would pose a challenge for the foreseeable future.

Bridges were not included in the original Trunk-Line legislation, but the Legislature did authorize special state bridge commissions to undertake the construction of three Connecticut River bridges at Hartford, Middletown, and Old Saybrook. The success of these projects led to legislation in 1915 that gave the State Highway Department authority over all the state's major bridges. Planning began immediately to replace the state's most deficient bridges.

Bridges on the shoreline road that ran through the towns along Long Island Sound were made the Department's top priority. Now known as Route 1 or the Boston Post Road, the route was the heaviest-traveled in the state, especially the portion between New Haven and the New York State border. Many of the state's most industrialized cities lay along this corridor, and already there were suburban commuting communities generating traffic to and from New York City. In the summer time, vacationers added to the congestion, especially at the numerous drawbridges across navigable rivers and harbor channels.

The Washington Bridge between Milford and Stratford, so named because it was on the route taken by George Washington in passing through Connecticut in 1775, was among those slated for immediate replacement. The old iron swing bridge at the site, which had been built in 1892, was narrow and did not have sufficient load capacity for

*In their optimism, engineers of the period probably underestimated the effect of scour on concrete bridge footings, and they certainly could not have foreseen the effects of road salt, which gets into the concrete and corrodes the reinforcement rod, causing cracks that lead to further deterioration.

trucks. When a streetcar was using the single track that ran along one side, the bridge effectively became one lane wide. Also, it was feared that the crowded open cars used by the trolley company in summer would expose passengers to injury from motor vehicles in the adjacent lane. Adding to the sense of urgency, the United States War Department wanted the state to replace all the movable bridges along the shore line, which were considered vital for national defense. In response, state engineers drew up plans for a Housatonic River bridge that would allow a dedicated space for two streetcar tracks, as well as wide lanes for motor vehicle traffic and pedestrian sidewalks; in place of the antiquated swing span, the state proposed a modern bascule, designed by a nationally prominent firm, that would provide a clear navigation channel 125 feet wide. Construction would have begun immediately, except that the federal government (despite the War Department's edict) would not authorize an allocation of steel for the bridge. Like many other bridge projects planned at the same time, work could not commence until World War I ended. Finally, in 1919, construction began on the bridge and was completed two years later. The total cost of $1,460,760.34 was divided equally among the state, the two counties, and the Connecticut Company, operator of the streetcar line.

The State Highway Department regarded the Washington Bridge as a showpiece. It was the largest and most expensive project the Department had constructed to date, and engineers from other states came to look at it and learn from it. A photograph of the Washington Bridge served as the frontispiece to the Highway Department's 1921 *Annual Report*, which in the narrative section expounded on its significance as a milestone:

> The construction of this bridge marks a very definite step forward in the transportation facilities of the State. At a cost of approximately $1,500,000, the Department, in cooperation with the counties, has erected a bridge which should stand and carry traffic for an indefinite period of years (p.19).

Years later, when the Department produced its 40th anniversary history of roads in Connecticut, the Washington Bridge was again included as one of the Department's most notable accomplishments.

Bibliography:

Clouette, Bruce, and Matthew Roth. Connecticut Historic Bridge Inventory. Connecticut Department of Transportation, 1990.

__________. *Connecticut's Historic Highway Bridges*. Newington, Conn.: Connecticut Department of Transportation, 1991.

Condit, Carl W. *American Building: Materials and Techniques from the First Colonial Settlements to the Present*. Chicago: University of Chicago Press, 1968.

Connecticut Department of Transportation. Plan Files, Special Bridge Drawers, Washington Bridge.

Connecticut Highway Commission. *Annual Report*, 1917-1922.

__________. *Forty Years of Highway Development in Connecticut, 1895-1935*. New Haven: Connecticut Tercentenary Commission, Publication No. 46, 1935.

Hool, George A., and W. S. Kinne. *Reinforced Concrete and Masonry Structures*. New York: McGraw-Hill Book Company, 1924.

Legat, Arthur W. *Design and Construction of Reinforced Concrete Bridges*. London: Concrete Publications, 1948.

McCullough, Conde B. *Economics of Highway Bridge Types*. Chicago: Gillette Publishing Co., 1929.

Saunders, Richard L. "The New Washington Bridge Over the Housatonic River," *Connecticut Society of Civil Engineers Proceedings* (1921), 106-110.

Urquhart, Leonard C., and Charles-Edward O'Rourke. *Design of Concrete Structures*. New York: McGraw-Hill Book Company, 1926.

Waddell, J. A. L. *Economics of Bridgework*. New York: John Wiley and Sons, 1921.

Verbal Boundary Description:

The nominated property includes the bridge, abutments, and piers.

Boundary Justification:

The nominated property embraces the entire historic structure.

All Photographs:

1. Washington Bridge
2. Milford-Stratford, New Haven-Fairfield County, CT
3. PAST, Inc. Photo
4. March 2003
5. Negative filed with PAST, Inc., Storrs, CT

Captions:

Overview of bridge, south side from west end, camera facing northeast
Photograph 1 of 6

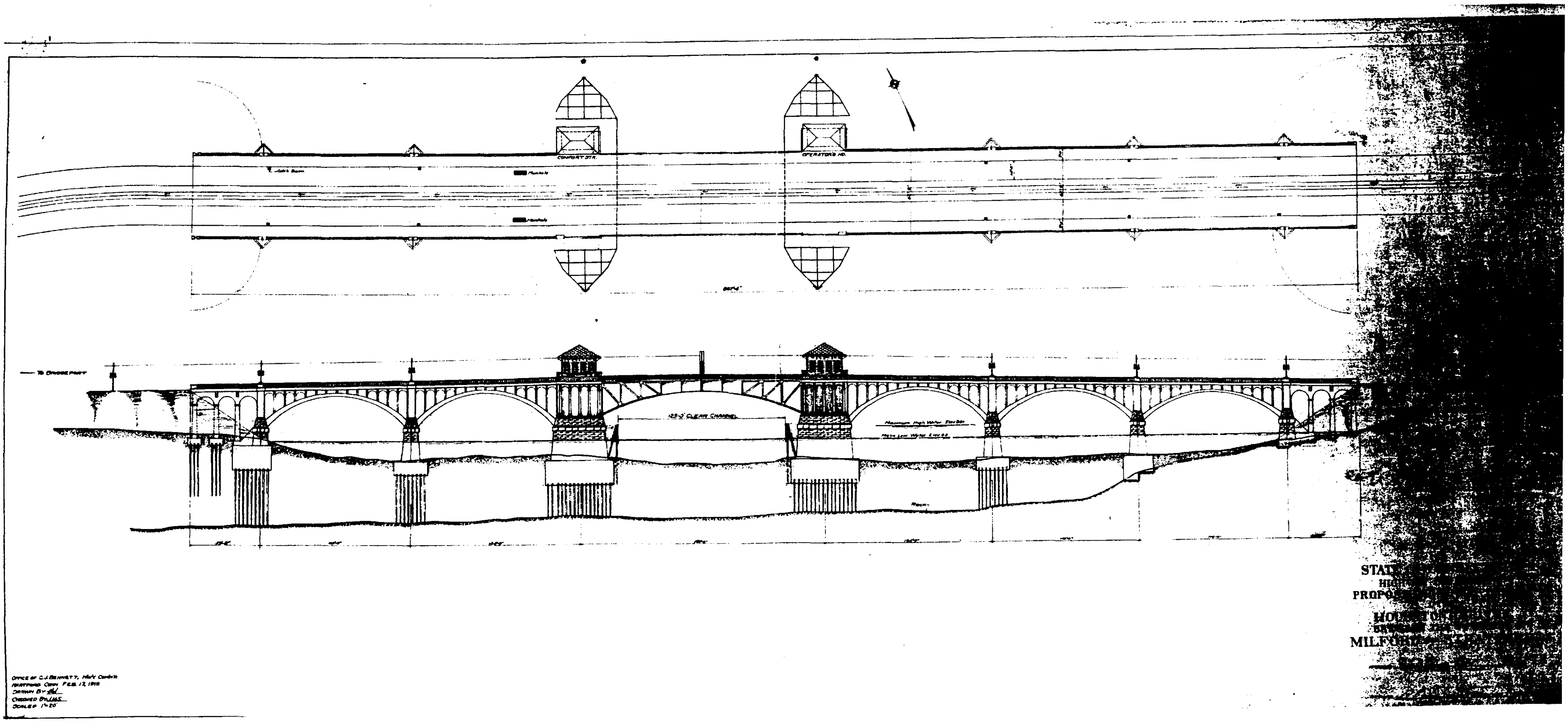
Overview of bridge, north side from west end, camera facing southeast
Photograph 2 of 6

Detail of open-spandrel spans, west end, camera facing northeast
Photograph 3 of 6

Detail of bascule, south side, camera facing northeast
Photograph 4 of 6

Detail of operators house, west end, camera facing east
Photograph 5 of 6

Detail of dedicatory plaque, camera facing south
Photograph 6 of 6



Comfort Sta.
Operators Ho.
To Bridgeport
125'-0" Clear Channel
Rock
Office of C.J. Bennett, Hwy Comm'r.
Hartford Conn Feb. 17, 1919
Drawn By
Checked By
Scale 1" = 20'