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United States Department of the Interior
National Park Service

APR 24 1989

National Register of Historic Places
Registration Form

NATIONAL
REGISTER

This form is for use in nominating or requesting determinations of eligibility for individual properties or districts. See instructions in *Guidelines for Completing National Register Forms* (National Register Bulletin 16). Complete each item by marking "x" in the appropriate box or by entering the requested information. If an item does not apply to the property being documented, enter "N/A" for "not applicable." For functions, styles, materials, and areas of significance, enter only the categories and subcategories listed in the instructions. For additional space use continuation sheets (Form 10-900a). Type all entries.

1. Name of Property

historic name Stillwater Bridge
other names/site number Minnesota Bridge No. 4654; Wisconsin Bridge No. B-55-919

2. Location

street & number MN Hwy. 36 and WI Hwy. 64 over the St. Croix River not for publication N/A
city, town See Continuation Sheet 2:1 vicinity
state _____ code _____ county _____ code _____ zip code _____

3. Classification

Ownership of Property	Category of Property	Number of Resources within Property	
<input type="checkbox"/> private	<input type="checkbox"/> building(s)	Contributing	Noncontributing
<input type="checkbox"/> public-local	<input type="checkbox"/> district	_____	_____ buildings
<input checked="" type="checkbox"/> public-State	<input type="checkbox"/> site	_____	_____ sites
<input type="checkbox"/> public-Federal	<input checked="" type="checkbox"/> structure	<u>1</u>	_____ structures
	<input type="checkbox"/> object	_____	_____ objects
		<u>1</u>	_____ Total

Name of related multiple property listing:
N/A

Number of contributing resources previously listed in the National Register 0

4. State/Federal Agency Certification

As the designated authority under the National Historic Preservation Act of 1966, 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. See continuation sheet.

Nina M. Archabal 4/13/89
Signature of certifying official Nina M. Archabal Date
Minnesota State Historic Preservation Officer
State or Federal agency and bureau Minnesota Historical Society

In my opinion, the property meets does not meet the National Register criteria. See continuation sheet.

[Signature] 5/25/89
Signature of commenting or other official Date
State Historic Preservation Officer-WI
State or Federal agency and bureau

5. National Park Service Certification

I, hereby, certify that this 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] 5/25/89
Entered in the National Register

[Signature] _____
Signature of the Keeper Date of Action

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Stillwater Bridge, Stillwater, MN and Houlton, WI

Section number 2 Page 1

Location: Bridge No. 4654

The bridge is situated in both Minnesota and Wisconsin. The geographical information for Minnesota is listed first.

City, town: Stillwater

State: Minnesota Code: MN County: Washington Code: 163 Zip Code: 55082

City, town: Houlton

State: Wisconsin Code: WI County: St. Croix Code: 109 Zip Code: 54082

6. Function or Use

Historic Functions (enter categories from instructions)

Transportation, road-related (vehicular)

Current Functions (enter categories from instructions)

Transportation, road-related (vehicular)

7. Description

Architectural Classification

(enter categories from instructions)

Other: Vertical lift bridge

Materials (enter categories from instructions)

foundation Concrete

walls _____

roof _____

other Steel

Describe present and historic physical appearance.

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Description: Stillwater Bridge

Connecting Stillwater, Minnesota on the west with Houlton, Wisconsin on the east, the Stillwater Bridge is a relatively unaltered 10-span, 2-lane highway crossing of the St. Croix River; it includes a counterweighted, tower-and-cable, vertical-lift span of the Waddell and Harrington type.

At the site of the Stillwater Bridge, the St. Croix River is approximately 1800 feet wide. The bridge itself, however, spans only about 1050 feet. The remaining distance is covered by a earthen causeway, which was built out from the Wisconsin shore to reduce the grade difference between the opposing banks, as well as to lower the fabrication costs of the bridge. Resting on reinforced-concrete piers and abutments, the bridge superstructure displays, from east to west, the following sequence of spans: 1 concrete-slab approach span, 5 fixed steel trusses, 1 vertical-lift span, 1 fixed steel truss, and 2 concrete-slab approach spans.

The six fixed truss spans are of similar size and configuration. Measuring approximately 140 feet in length, each is a 7-panel, riveted, through Parker truss with angle-iron portal, top-lateral, and sway bracing. The webs are further stiffened by horizontal, angle-iron bracing across the four center panels. Except for the top chord -- which consists of heavy paired channels tied with cover plate above and X-lacing below -- the web members are built of paired, back-to-back angles tied with batten plates (as in the bottom chord and diagonals) or V-lacing (as in the verticals).

The vertical-lift span is also a 140-foot, 7-panel, Parker through truss. In its method of operation, the span embodies a design originally developed by J. A. L. Waddell in 1892, and subsequently refined in partnership with John Lyle Harrington. The general type is customarily known as a "Waddell and Harrington vertical lift." The span is raised and lowered by steel cables passing over sheaths at the top of steel towers mounted on the span's piers. To ensure easy movement, the span is counterweighted by concrete blocks that travel up and down within the tower framework. Originally, the motive force was supplied by a gasoline engine, which was replaced by a 25-horsepower electric motor in 1980. The control machinery is sheltered in a welded, plate-steel, gable-roofed "operator's house" mounted at roadway level on a steel framework at mid-span on the north (upstream) side. Reduction gears and winding drums for the cables are located beneath the house. With the span in raised position, vertical navigational clearance is 57 feet above normal pool elevation. The span itself is engineered for a rise of 48 feet, although an additional 3 feet of lift are available for emergency situations.

Measuring 23 feet in width, the bridge's concrete deck is bordered on the north by an angle-iron railing and on the south by a concrete sidewalk with an ornamental metal railing. The sidewalk is cantilevered on metal brackets. Although ornamental street lights have been removed from their newel posts along the sidewalk, a few of the original lighting fixtures remain on the concrete railings at the westernmost,

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concrete-slab, approach span. The concrete deck was rebuilt in 1973, as was the east-shore, concrete-slab, approach span in 1979. None of these alterations has significantly affected the bridge's integrity. The vertical-lift span remains in operation during the May-October navigation season.

8. Statement of Significance

Certifying official has considered the significance of this property in relation to other properties:

nationally statewide locally

Applicable National Register Criteria A B C D

Criteria Considerations (Exceptions) A B C D E F G

Areas of Significance (enter categories from instructions)

Engineering

Period of Significance

1931

Significant Dates

1931

Cultural Affiliation

N/A

Significant Person

N/A

Architect/Builder

See below

State significance of property, and justify criteria, criteria considerations, and areas and periods of significance noted above.

Engineer: Minnesota Department of Highways (fixed spans);
Ash, Howard, Needles, and Tammen (vertical-lift span)

Fabricator: American Bridge Company (Minneapolis and Gary Plants)

Builder: Peppard and Fulton

See continuation sheet

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Significance: Stillwater Bridge

Featuring a counterweighted, cable-and-tower design, the Stillwater Bridge embodies engineering significance as a rare surviving example of vertical-lift highway bridge construction of the Waddell and Harrington type.

The significance of the Stillwater Bridge is best evaluated within the general context of Minnesota and Wisconsin movable highway bridges. Movable bridges, also known as drawbridges, are constructed over navigable waterways when it is impractical or uneconomical to build fixed bridges of sufficient height to permit the passage of vessels. Human ingenuity has devised numerous systems for lifting, dropping, folding, rotating, and retracting a span to provide temporary clearance. By the early twentieth century, however, American engineers had focused their attention on three, basic, drawbridge categories: swing, bascule, and vertical lift.

Briefly defined, a swing span revolves in a horizontal plane around a vertical axis, a bascule span rotates in a vertical plane around a horizontal axis, and a vertical-lift span rises and descends in a vertical plane. As Table 1 indicates, a total of 108 movable highway bridges existed in Minnesota and Wisconsin in 1935, with Wisconsin claiming more than six times the share of its neighbor. Wisconsin's greater dependence on movable bridges was a function of both its canal system along the industrialized Fox waterway and its numerous navigable rivers in major port cities (Green Bay, Manitowoc, Milwaukee, Racine, Sheboygan). In contrast, commercial navigation in Minnesota was largely restricted to the Mississippi River, where elevated bluffs obviated the need for movable spans.

In Minnesota and Wisconsin, as well as elsewhere in the nation, virtually all nineteenth-century movable bridges were of the swing-span variety, and the type continued to be constructed during the early twentieth century. As late as 1935, a total of 51 highway swing spans were in operation in the two states. Not one of these structures survives.² The demise of the highway swing span was nation-wide, reflecting its growing incompatibility with an urban setting. There were two basic problems. First, the central pivot pier increasingly became an obstruction to navigation for the ever-larger vessels of the late nineteenth and early twentieth centuries. Second, the swing span itself squandered valuable space. By requiring a clear turning radius, it prohibited the development of docking facilities adjacent to the bridge site.³ These shortcomings were especially onerous along highly industrialized urban waterways, where shipping channels tended to be narrow, highway crossings numerous, and real estate prices high. For less crowded sites, the swing span remained a viable form of technology well into the twentieth century. Most surviving swing spans, for example, are railroad bridges in rural regions or in relatively uncongested urban areas. But in the downtown waterfronts of late nineteenth-century American cities, the swing span was marked for extinction. Its major adversary was the federal government.

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TABLE 1
Minnesota and Wisconsin Movable Highway Bridges, 1935
(N = 108)

Construction Date	Swing		Bascule		Vertical Lift	
	MN	WI	MN	WI	MN	WI
Unknown	2	6	0	0	0	0
Pre-1880	0	1	0	0	0	0
1880-1889	1	3	0	0	0	0
1890-1899	3	12	0	1	0	0
1900-1909	0	12	0	8	0	0
1910-1919	1	7	0	9	1	0
1920-1929	0	3	3*	19*	2*	2*
1930-1935	0	0	0	12	2*	1*
State Total:	7	44	3*	49*	5**	3**
Combined Total:	51		51		6	

- * Includes 1 MN-WI Interstate Bridge
- ** Includes 2 MN-WI Interstate Bridges

Source: Office of the Chief of Engineers, United States Army, List of Bridges Over the Navigable Waters of the United States . . . Revised to January 1, 1935 (Washington, D.C.: Government Printing Office, 1936).

Note: Table does not include movable highway spans included in "double-deck" railroad bridges.

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No matter how loudly shipping and real-estate interests might denounce the swing span, there was no effective means of regulating movable-bridge design until the early 1890s, when Congress authorized the War Department to approve plans for all new bridges over navigable waterways and to seek the alteration of any existing bridge that interfered with "reasonably free, easy and unobstructed" navigation.⁴ In 1892, the War Department sent a clear message of future policy by way of Chicago, demanding the removal of a two-year-old swing span from one crossing of the Chicago River and denying permission to build a new swing span at another. The search for an alternate drawbridge technology began in earnest. Not surprisingly, Chicago was in the vanguard. In 1895, municipal authorities spanned the Chicago River at South Halsted Street with the world's first, modern, vertical-lift bridge.⁵

During the middle decades of the nineteenth century, an occasional vertical-lift span was constructed in Europe and the United States. Although their engineering was often ingenious, the bridges themselves were quite modest, designed mainly for "canals and small navigable streams in cases where it was only necessary to lift the spans a few feet to clear traffic in the channels."⁶ The modern, long-span, high-rise vertical-lift bridge dates from the last decade of the nineteenth century. In 1892, the City of Duluth, Minnesota hosted a design competition for constructing a drawbridge over its harbor entrance on Lake Superior, which comprised a clear channel 250-feet in width. Under the rules of the competition, the successful design "would leave the entire width of the canal free to passing vessels," which effectively eliminated traditional, center-pier swing spans.

Most responses to the Duluth competition employed some form of "sliding draw" mechanism, whereby the span moved back and forth on rollers. A striking exception was a design submitted, and later patented, by John Alexander Low Waddell (1854-1938), a consulting engineer based in Kansas City, Missouri, who, during the next forty years, would become "one of the best-known bridge engineers in the United States."⁸ Waddell proposed to build "a vertical lift bridge consisting of a simple truss span 260 ft. long so constructed and supported as to allow of being raised vertically to a height of 140 ft. above the surface of the canal."

At each end of the movable span is a tower 170 ft. high, carrying at its top built steel pulleys about 15 ft. in diameter. Over these pulleys steel wire ropes, or chain cables, pass. One end of each cable is attached to the end piers of the trusses, and end to counter-weights which exactly balance the dead weight of the span. The only work left for the operating machinery is, therefore, to overcome the weight due to dirt, water, snow, etc. The power for operating the bridge is supplied by two electric motors placed at mid-span; the upward and downward motion being regulated by racks and pinions communicating with the power by means of steel shafting and spur and mitre wheels.

Although the Duluth authorities selected Waddell's design, the War Department vetoed the construction of any drawbridge at that site at that time. Waddell, however, had

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devised a seemingly practical solution to the drawbridge problem. His vertical-lift span did not obstruct navigation and dockage like a swing span, nor did it clutter up the shore approaches like a sliding-draw span. A few months after the cancellation of the Duluth project, the City of Chicago commissioned Waddell to modify his original design for a 130-foot span capable of 150-foot clearance over the Chicago River at South Halsted Street. This structure was completed in 1894.¹⁰

The South Halsted Street Vertical-Lift Bridge remained the only example of its kind for over a decade. In later years, Waddell attributed the long delay in constructing another vertical lift to the knavery of those in charge of subsequent bridge projects, who, as he put it, "demanded boodle -- a condition with which [I] never did and never will comply."¹¹ There were other reasons as well. During the period 1895 to 1905, engineers in Chicago and Milwaukee perfected several bascule designs, which were widely believed to be more economical for narrow waterways than Waddell's vertical lift. The new type received early and strong endorsement from the City of Milwaukee, which built 10 bascule spans between 1902 and 1910. It was subsequently adopted as the preferred movable-bridge type by the Wisconsin State Highway Commission, organized in 1911 to improve the state's roads and bridges. But the greatest obstacle to the initial acceptance of the vertical-lift span was the fact that the South Halstead Street Bridge contained certain mechanical flaws, which gave it the reputation for "heavy first cost and maintenance,"¹² and expensive operation.

In 1907, Waddell formed a partnership with John Lyle Harrington (1868-1942), a skilled civil and mechanical engineer who was largely responsible for reworking Waddell's invention into "a rational, well-integrated design."¹³ In its essential form and dynamics, the "Waddell and Harrington version" remained true to the original 1892 design: "A simple span equipped with machinery for operation, suspended at each end by wire ropes which pass over sheaves on towers and connect to counterweights about equal to the span weight."¹⁴ Before the partnership dissolved in 1914, Waddell and Harrington designed about 30 vertical-lift spans for highway and railroad crossings.¹⁵ After they parted company, both men continued to work in the field, and Harrington's new office -- Harrington, Howard, and Ash -- became particularly well known, as was its successor, Ash, Howard, Needles and Tammen.

Six vertical-lift highway bridges were constructed in Minnesota and Wisconsin before World War II. At least 5 were designed by Waddell and Harrington or successor firms. All were of the standard Waddell and Harrington type. As Table 2 indicates, the 1931 Stillwater Bridge was the last of this cohort to be completed. Its predecessor at the site was a timber, pontoon, swing bridge built in 1910. Owned and maintained by the City of Stillwater, the bridge was taken over by the Minnesota Department of Highways in 1925. By that time, the structure was "fast deteriorating so as to be a source of apprehension for the safety of . . . the loads it is obliged to carry." When the bridge was closed to heavy traffic in 1928, the Minnesota Department of Highways prepared preliminary plans for its replacement.¹⁶

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TABLE 2
Minnesota and Wisconsin Vertical-Lift Highway Bridges Built Before World War II

Construction Date	Demolition Date	Site	Engineer	Horizontal Clearance	Vertical Clearance
1913	1959	Red R., Olso, MN	Waddell & Harrington	150'	63'
1918	1939	Mississippi R., Ball Club, MN	Unknown	56'	64'
1923	---	St. Croix R., Prescott, WI/ Pt. Douglas MN	Harrington, Howard & Ash	160'	74'
1926	1983	US Govt. Canal, Kaukauna, WI	Harrington, Howard & Ash	100'	65'
1930*	---	Ship Canal, Lake Superior, Duluth, MN	Harrington, Howard & Ash	300'	135'
1931	---	St. Croix R. Stillwater, MN/ Houlton, WI	Ash, Howard, Needles & Tammen	136'	65'

* Date of conversion to vertical lift design; the original structure was constructed in 1905 as an aerial lift, or "carry ferry," bridge.

Source: Minnesota Department of Transportation; Wisconsin Department of Transportation

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These plans called for a series of fixed concrete-slab and steel-truss spans, which were to be designed by the Minnesota highway agency itself, and a single vertical-lift span, which was to be the responsibility of an engineering firm specializing in such work. In November 1929, a design contract for \$3,150 was awarded, on a competitive basis, to Ash, Howard, Needles & Tammen of Kansas City, Missouri. Construction on the bridge proper began the following summer, with the Minneapolis firm of Peppard and Fulton serving as general contractor and the American Bridge Company (Minneapolis and Gary plants) serving as fabricator. The project was completed in August 1931 for a total cost of \$460,174, shared on an approximately 50-50 basis by the states of Minnesota and Wisconsin.¹⁷

At the time of the bridge's completion, the St. Croix River was only lightly used as a navigable waterway. Since most of the traffic was small craft, there was little occasion to operate the lift span. As the Minnesota Department of Highways noted in 1938, "for several years not a single request for its opening was received."¹⁸ Although the bridge was far more intensely involved in highway traffic, it was in the role of maintaining, rather than initiating, patterns of transportation, which, in fact, were already well established by the 1930s. The bridge does have significance, however, as a rare type of engineering construction. Only 6 vertical-lift highway bridges were built in Minnesota and Wisconsin prior to World War II, and the Stillwater Bridge is one of three that still survives. In recognition of its importance, the structure was declared eligible for listing in the National Register of Historic Places in 1987.

NOTES

1. This discussion closely follows the text of a study completed by the author for the Wisconsin Department of Transportation (WisDOT). Under the title of "Wisconsin Movable Bridges," the study will be published for limited distribution by WisDOT in 1989, as the third volume in the agency's "Historic Highway Bridges in Wisconsin" series.
2. Table 1 does not include movable highway bridges built as part of double-deck railway bridges. A swing span of this description survives in Minnesota, providing a combined railroad and highway crossing of the Mississippi River between Inver Grove (Dakota County) and Newport (Washington County). Constructed in 1895, the structure is Minnesota's only private toll bridge; see Minnesota Department of Transportation (MNDOT) files for Bridge No. 3450.
3. "The Design of Movable Bridges," Engineering News, 36 (November 5, 1896), 297; J. A. L. Waddell, Economics of Bridgework (New York: John Wiley and Sons, 1921), pp. 284-285; Egbert R. Hardesty and others, "Fifty-Year History of Movable Bridge Construction -- Part I," Journal of the Construction Division, Proceedings of the American Society of Civil Engineers, 101 (September 1975), 511-513.

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Notes Con't.

4. W. M. Black, "Bridges Over Navigable Waters of the United States," Engineering News (April 13, 1893), 341-342.
5. Donald N. Becker, "Development of the Chicago Type Bascule Bridge," American Society of Civil Engineers Proceedings (February 1943), 266, 268.
6. Otis Ellis Hovey, Movable Bridges, vol. 1 (New York: John Wiley and Sons, 1926), pp. 146-151; see also H. G. Tyrrell, "A Comparison of Old and New Designs for Vertical-Lift Bridges," Engineering News, 70 (July 31, 1913), 225-226.
7. "Competitive Designs for a Drawbridge Over the Duluth Ship Canal, Duluth, Minn.," Engineering News, (October 27, 1892), 390.
8. James K. Finch, "John Alexander Low Waddell," Dictionary of American Biography, Supplement 2, vol. 22, pp. 686.
9. "Competitive Designs," 391. Waddell's vertical-lift design was covered by Letters Patent No. 506,571, dated October 10, 1893.
10. "The Proposed Bridge Over the Harbor Entrance at Duluth," Engineering Record, 25 (May 14, 1892), 398-399; J. A. L. Waddell, "The Halsted Street Lift-Bridge," American Society of Civil Engineers Transactions, 33 (January 1895), Paper No. 742, 1-16; "The South Halsted Street Lift Bridge, Chicago," Engineering Record, 27 (March 4, 1893), 273-276.
11. Waddell, "The Vertical Lift Bridge," Journal of the Western Society of Engineers, 29 (May 1924), 211-212. In his 1916 text, Bridge Engineering (New York: John Wiley and Sons), Waddell was a bit more circumspect: "For many years after the completion of the Halsted Street structure the author endeavored unsuccessfully to build similar bridges at other places, the main reason for his failures being that he often ran into political and financial conditions of such a nature that his engineer's conscience prevented his dealing with the parties interested" (vol. 1, p. 723).
12. The critique of Waddell's vertical-lift design is from Schneider's "Movable Bridges," Transactions, 268-269, which Waddell himself described as "a masterly paper"; Bridge Engineering, vol. 1, p. 683. In the same work (pp. 723-724), Waddell briefly acknowledges that the Halsted Street Bridge did not operate satisfactorily until about 1907, when "changes [were] made in the machinery." On bascule development in Milwaukee and Chicago, see Henry G. Tyrrell, "Lift Bridges of Milwaukee," Municipal Engineering, 45 (July 1913), 2-7; Donald N. Becker, "Development of the Chicago Type Bascule Bridge," American Society of Civil Engineers Proceedings (February 1943), 263-293.

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Notes Con't.

13. Edwin Layton, "John Lyle Harrington," Dictionary of American Biography, Supplement No. 3, p. 331; Waddell credits Harrington's contributions in Bridge Engineering, vol. 1, pp. 723-724.
14. Ernest E. Howard, "General Elements in the Design of Vertical Lift Bridges," Railway Age, 70 (June 17, 1921), 1393. The Waddell and Harrington design was not the only vertical-lift type available. In 1913, the engineering press noted that two Chicago firms -- the Strobel Steel Construction Company and the Strauss Bascule Bridge Company -- had recently, and independently, introduced vertical-lift spans that were hoisted by counterweighted, trussed levers rather than by cables. For the most part, these designs were considered most economical "where the height of travel or lift is not great." Few were built. See "A Vertical-Lift Drawbridge Without Cables," Engineering News, 69 (June 5, 1913), 1170; "The Strauss Direct Lift Bridge," Railway Age Gazette, 54 (March 18, 1913), 553-554; "Direct-Lift Bridges," Engineering Record, 68 (October 11, 1913), 403.
15. Waddell, Bridge Engineering, vol. 1, p. 744.
16. The best source of information on the history of the Stillwater Bridge are MNDOT's archival files on the structure (Bridge No. 4654). Unless otherwise noted, cited material regarding the bridge is from this source. On the earlier pontoon bridge, see R. J. Coffeen, Mayor of Stillwater, to W. F. Rosenwald, Maintenance Engineer, Minnesota State Highway Department, April 8, 1925. The transfer of the bridge's ownership from the city to the state is noted in Stillwater (MN) Gazette, April 1, 1925. The bridge's deteriorating condition is evaluated E. J. Miller, "Stillwater Bridge Report," April 13, 1926. For preliminary replacement plans, see New Richmond (WI) News, November 28, 1928. Although the Minnesota Department of Highways was in charge of design, the agency sought the opinion of the Wisconsin State Highway Commission on a variety of technical issues. For example: "It is our intention to design the truss spans . . . using a concrete floor slab as a wearing surface direct allowing in our design, however, a weight of about 25 pounds per square foot to take care of any future surfacing. I would like to have an expression from you as to your views on this item"; M. J. Hoffman, Bridge Engineer, Minnesota Department of Highways to C. H. Kirch, Bridge Engineer, Wisconsin State Highway Commission, December 7, 1928.

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Notes Con't.

17. There are numerous documents in the MNDOT archives concerning the selection of the engineer and contractor. The role of the American Bridge Company is noted in an undated memo on materials and subcontractors prepared by Peppard and Fulton for the Minnesota Department of Highways shortly after the award of the contract. The engineer's final inspection report is contained in E. E. Howard of Ash, Howard, Needles, and Tammen to M. J. Hoffman, Bridge Engineer, Minnesota Department of Highways, August 4, 1931. A "Final Cost Statement" for the bridge is appended to W. B. Blair, Chief Accountant, Wisconsin Highway Commission to M. H. Hoffman, November 28, 1931.
18. Minnesota Department of Highways to F. M. Albrecht, Acting District Engineer, U.S. Army Corps of Engineers, May 2, 1938.

9. Major Bibliographical References

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 Buildings Survey # _____
- recorded by Historic American Engineering Record # _____

See continuation sheet

Primary location of additional data:

- State historic preservation office
- Other State agency
- Federal agency
- Local government
- University
- Other

Specify repository: _____

10. Geographical Data

Acreage of property Less than one acre

UTM References

A

1	5	5	1	5	4	9	0	4	9	8	9	0	2	0
Zone			Easting					Northing						

C

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

B

1	5	5	1	5	7	4	0	4	9	8	9	1	2	5
Zone			Easting					Northing						

D

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

See continuation sheet

Verbal Boundary Description

The nominated property is bounded on the north (upstream) by a line parallel to, and 13.4 feet from, the bridge's center line, and on the south (downstream) by a line parallel to, and 20.6 feet from, the bridge's center line. It is bounded on the west by the west end of the west abutment, and on the east by the east end of the east abutment.

See continuation sheet

Boundary Justification

Based on measurements provided by the Minnesota Department of Transportation, the boundaries enclose the superstructure and substructure of all ten bridge spans.

See continuation sheet

11. Form Prepared By

name/title Jeffrey A. Hess, Historical Consultant
organization N/A date August 1988
street & number 305 Grain Exchange Building telephone 612-338-1987
city or town Minneapolis state Minnesota zip code 55415

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Bibliography: Stillwater Bridge

Published Sources

- Becker, Donald N. "Development of the Chicago Type Bascule Brige." American Society of Civil Engineers Proceedings (February 1943), 263-293.
- Black, W. M. "Bridges Over Navigable Waters of the United States." Engineering News (April 13, 1893), 341-342.
- "Competitive Designs for a Drawbridge Over the Duluth Ship Canal, Duluth, Minn." Engineering News, (October 27, 1892), 390-391.
- "The Design of Movable Bridges." Engineering News, 36 (November 5, 1896), 296-297.
- "Direct-Lift Bridges." Engineering Record, 68 (October 11, 1913), 403.
- Hardesty, Egbert R. and others. "Fifty-Year History of Movable Bridge Construction -- Part I." Journal of the Construction Division, Proceedings of the American Society of Civil Engineers, 101 (September 1975), 511-527.
- Howard, Ernest E. "General Elements in the Design of Vertical Lift Bridges." Railway Age, 70 (June 17, 1921), 1393-1394.
- Hovey, Otis Ellis. Movable Bridges. New York: John Wiley and Sons, 1926. 2 vols.
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