

SPOKANE RIVER BRIDGE AT FORT SPOKANE
State Route 25 spanning the Spokane River
Miles
Lincoln County
Washington

HAER No. WA-113

HAER
WASH
22-MILES
1-

WRITTEN HISTORICAL AND DESCRIPTIVE DATA
PHOTOGRAPHS

HISTORIC AMERICAN ENGINEERING RECORD
NATIONAL PARK SERVICE
DEPARTMENT OF THE INTERIOR
P.O. BOX 37127
WASHINGTON, D.C. 20013-7127

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Location: State Route spanning the Spokane River, Miles, between Lincoln and Stevens counties, Washington, beginning at mile point 23.35.

UTM: 11/401400/5306680
11/401360/5306740

Quad: Fort Spokane, Wash.

Date of Construction: 1941

Engineer: Washington Department of Highways
R. W. Finke, bridge engineer

Fabricator: C. and F. Teaming and Trucking of Butte, Montana, steel construction; Angeles Gravel and Supply Company, Port Angeles, Washington, concrete construction

Owner: Washington Department of Highways, since 1977 Washington State Department of Transportation, Olympia, Washington

Present Use: Vehicular and pedestrian traffic

Significance: This bridge was one of two steel cantilever spans that the Washington Department of Highways constructed to replace structures flooded by the waters rising behind Grand Coulee Dam.

Historian: Robert W. Hadlow, Ph.D., August 1993

History of the Bridge

The Spokane River Bridge at Fort Spokane is the largest bridge constructed in Washington in the 1940s before American involvement in World War II precluded bridge building. Financed by the United States Bureau of Reclamation, along with one other highway structure, the Columbia River Bridge at Kettle Falls (HAER No. WA-91) was part of a highway relocation program in conjunction with the Grand Coulee Dam--Columbia Basin Reclamation Project. The dam raised the Columbia River and tributaries including the Spokane River, creating the 151-mile-long Franklin D. Roosevelt Lake. The reservoir's formation necessitated replacing the two highway bridges and one railroad structure. The cantilever design used for the Spokane River Bridge at Fort Spokane was the most economical type of bridge for the location because the river's depth even prior to the dam's construction precluded using any design that required mid-channel falsework.¹

Ferries traveled across the Spokane near its confluence with the Columbia as early as the mid-1880s when United States Army soldiers stationed at nearby Fort Spokane installed a cable northward across the river for a stream-powered boat to connect their post with the Spokane Indian Reservation. Other ferries followed, but early in the twentieth century, the Detillion Bridge, a 200' steel and timber Howe truss, was built. It served as part of state route 22 (later renumbered route 25) connecting Davenport, to the south, with Fruitland northward to Kettle Falls.²

The Detillion Bridge collapsed in May 1939 shortly after a semi-trailer became unhitched from its tractor and rolled onto the bridge, destroying one of its inclined end posts and initiating a progressive collapse of the structure. The Washington Department of Highways erected a temporary bridge to maintain traffic flow on route 22 until it constructed a permanent replacement bridge, with a 756'-8" steel deck cantilever as part of the highway relocation program connected with the Grand Coulee Dam--Columbia Basin Reclamation Project.³

The U.S. Bureau of Reclamation constructed Grand Coulee Dam on the Columbia River in the second half of the 1930s to harness the free-flowing Columbia, diverting a part of its water to irrigate 1.2 million acres of rich desert land and to generate electricity. The dam, one of the largest concrete structures in the world, created Empire Lake (later renamed Franklin D. Roosevelt Lake), a 151-mile-long reservoir section of the river that spread over 82,000 acres and embraced the lower reaches of the Spokane and Kettle rivers. In 1941, the Bureau of Reclamation reimbursed the railroads \$732,000 for relocating

their lines, the state of Washington \$1,733,000 for moving portions of highways, and both transport groups \$1,366,000 for three new bridges--highway and railroad structures at Kettle Falls and a highway bridge at Fort Spokane.⁴

Design and Description

The Washington Department of Highways constructed the following bridge over the Spokane River at Fort Spokane. Reading south to north (east to west by compass) the bridge is composed of:

- one 37' reinforced-concrete T-beam span
- one 36'-8" reinforced-concrete T-beam span
- one 162'-4" steel through truss anchor arm
- one 135' steel through truss cantilever span
- one 162' steel Warren through truss suspension span
- one 135' steel through truss cantilever span
- one 162'-4" steel through truss anchor arm
- one 52'-6" reinforced-concrete T-beam span
- one 55' reinforced-concrete T-beam span
- one 15' reinforced-concrete T-beam span
- deck width, curb-to-curb is 24'
- one 3'-6" sidewalk
- total length for the steel spans--756'-8"
- total length of main spans--432'

The steel spans consist of twenty-eight 27' panels with vertical chords 60' at their deepest points. The two reinforced-concrete dumbbell-shaped channel piers rest on steel piling. Combined with the steel cantilever's horizontal bottom chord, they gave a 35' vertical shipping clearance at high water where stream depth exceeds 200'.⁵

Specifications called for both silicon and carbon steel. Again, as with the Columbia River Bridge at Kettle Falls (HAER No. WA-91), rolled channels with riveted punch plates were used throughout the structure. Likewise, a curved lower member is employed in both the sway and portal bracing. Its shape provides additional rigidity because of the thrusting action of the arch to the verticals and inclined endposts, respectively. The floor system is made up of I-beam construction. The configuration of bracing and components are also similar to those used in the Washington Department of Highways' standard plan truss bridge of the late 1930s and early 1940s.⁶

Unlike the Kettle Falls structure, with its sloped bottom chords on its cantilever and anchor arm spans, the Spokane River Bridge at Fort Spokane is truly a through truss with its bottom chord continuously horizontal. Close shoreline clearances did not

permit using anchor arm trusses with sloped bottom chords. The Spokane River Bridge's design harkens back to the early twentieth century structures, with its cantilever and anchor arm top chords sloping downward from above the channel piers before connecting to the suspended span and anchor points. But its modified Warren truss panels are free from the cluttered appearance that intermediate bracing gave to those bridges and also falls in line with the Washington Department of Highways' mandate to produce sturdy, reliable, and economical bridges through standardized plan--standardized component methods.⁷

On 22 August 1940, the Angeles Gravel and Supply Company of Port Angeles, Washington received an \$82,389.81 contract to built the reinforced-concrete piers and T-beam approach spans. Angeles completed its work on 18 June 1941. On 24 October 1940, the C. and F. Teaming and Trucking Company of Butte, Montana, received a \$196,637.61 contract to construct the steel superstructure and its concrete deck. The company completed work on 5 December 1941.⁸

Repair and Maintenance

Yearly inspections of the Spokane River Bridge at Fort Spokane since the 1950s reported transverse cracking in the concrete deck. In 1990, minor erosion near the north abutment had revealed piling and that an oversized vehicle had damaged the north portal's bottom flange and several sway braces. A fracture critical inspection from 1990 reported no weak pin connections.⁹

For additional information and a comparative study of the evolution of cantilever design in Washington, see:

WASHINGTON KING COUNTY SEATTLE
WASHINGTON STATE CANTILEVER BRIDGES (HAER No. WA-106)

Data Limitations

Data was severely limited on the Spokane River Bridge at Fort Spokane. It received minimal coverage in trade publications and in Department of Highways reports. A guide or index to the Spokane, Washington, newspapers might have listed citations for articles about the bridge. Researching the Spokane County Library's newspaper clipping files or vertical files might have been useful, but limited hours at the facility's present temporary location reduced their availability for perusal. The Cheney Cowles Memorial Museum/Eastern Washington State Historical Society in Spokane, a regional repository, has no specific resources on the Fort Spokane bridge.

Project Information

This project is part of the Historic American Engineering Record (HAER), National Park Service. It is a long-range program to document historically significant engineering and industrial works in the United States. The Washington State Historic Bridges Recording Project was co-sponsored in 1993 by HAER, the Washington State Department of Transportation (WSDOT), and the Washington State Office of Archeology & Historic Preservation. Fieldwork, measured drawings, historical reports, and photographs were prepared under the general direction of Robert J. Kapsch, Ph.D., Chief, HABS/HAER; Eric N. DeLony, Chief and Principal Architect, HAER; and Dean Herrin, Ph.D., HAER Staff Historian.

The recording team consisted of Karl W. Stumpf, Supervisory Architect (University of Illinois at Urbana-Champaign); Robert W. Hadlow, Ph.D., Supervisory Historian (Washington State University); Vivian Chi (University of Maryland); Erin M. Doherty (Miami University), Catherine I. Kudlik (The Catholic University of America), and Wolfgang G. Mayr (U.S./International Council on Monuments and Sites/Technical University of Vienna), Architectural Technicians; Jonathan Clarke (ICOMOS/Ironbridge Institute, England) and Wm. Michael Lawrence (University of Illinois at Urbana-Champaign), Historians; and Jet Lowe (Washington, D.C.), HAER Photographer.

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- Meinig, D. W. *The Great Columbia Plain: A Historical Geography, 1805-1910*. Seattle: University of Washington Press, 1968.
- Nullet, Lewis, and Joan Nullet. *A Brief History of Kettle Falls: the First Fifty Years*. n.p.: 1992.
- Ruby, Robert H., and John A. Brown. *Ferryboats on the Columbia River, Including the Bridges and Dams*. Seattle: Superior Publishing Company, 1974.
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- U.S. Department of the Interior. Bureau of Reclamation. *The Grand Coulee Dam and the Columbia Basin Reclamation Project, 1937*, reprinted edition,
- U.S. Department of the Interior. National Park Service. "Lake Roosevelt, Coulee Dam National Recreation Area, Washington, Official Map and Guide" [1990]
- U.S. Department of the Interior. National Park Service. "National Register of Historic Places Registration Form for Columbia River Bridge at Kettle Falls, Ferry and Stevens counties, Washington." 1991.
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- Washington. Department of Highways. *Nineteenth Biennial Report of the Director of Highways, 1940-1942*.
- Washington. State Department of Transportation. Bridge Preservation Section. Bridge Files.

ENDNOTES

¹ Department of the Interior, National Park Service, "National Register of Historic Places Registration Form for the Columbia River Bridge at Kettle Falls, Ferry and Stevens counties, Washington," 1991, sec. 7, p. 1; Washington, Department of Highways, *Nineteenth Biennial Report of the Director of Highways, 1940-1942*, 20.

² Robert H. Ruby and John A. Brown, *Ferryboats on the Columbia River, Including the Bridges and Dams* (Seattle: Superior Publishing Company, 1974), 153.

³ "Spokane River Bridge Wrecked by Truck," *Engineering News-Record* 122 (8 June 1939): 748.

⁴ Department of the Interior, National Park Service, "Lake Roosevelt, Coulee Dam National Recreation Area, Washington, Official Map and Guide" [1990]; Department of the Interior, Bureau of Reclamation, *The Grand Coulee Dam and the Columbia Basin Reclamation Project, 1937*, reprinted edition, 3, 8; Nullet and Nullet, *A Brief History of Kettle Falls: the First Fifty Years*, 75-76; state highways affected by the Grand Coulee Dam project were primary route numbers 3 between Kettle Falls and Barstow, 4 along the Columbia River, and 22 for much of its length along the Columbia. These routes in later years were renumbered U.S. 395, state route 20, and state route 25 respectively. See Washington, Department of Highways, *Eighteenth Biennial Report of the Director of Highways, 1938-1940*, 48.

⁵ "Spokane River Bridge at Fort Spokane, No. 25/6, "Kardex" Card File, Bridge Preservation Section, Washington State Department of Transportation, Olympia, WA [WSDOT].

⁶ *Ibid.*; one example of the standard-plan truss bridge used by the Washington Department of Highways is the Chehalis River Riverside Bridge, HAER No. WA-111.

⁷ "Spokane River Bridge at Fort Spokane, No. 25/6," Kardex Card File, Bridge Preservation Section, WSDOT.

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⁸ Washington Department of Highways, *Nineteenth Biennial Report of the Director of Highways, 1940-1942*, tables 15, 23, and 24.

⁹ "Bridge Inspection Reports, 1950-92," and Fracture Critical Inspection Report, 23 October 1990," in "Spokane River Bridge at Fort Spokane, No. 25/6," Correspondence Files, Bridge Preservation Section, WSDOT.