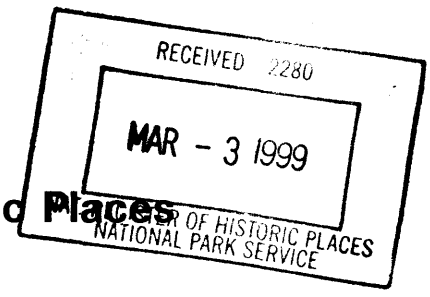
NPS Form 10-900
(Revised Feb. 1993)

OMB No. 10024-0018

United States Department of the Interior
National Park Service



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National Register of Historic Places Registration Form

This form is for use in nominating or requesting determinations of eligibility for individual properties or districts. See instructions in *How to Complete the National Register of Historic Places Form* (National Register Bulletin 16A). Complete each item by 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 **NORTH FORK PAYETTE RIVER BRIDGE**

other names/site number Rainbow Bridge/IHSI #85-2114

2. Location

street & number Approx. 2.5 miles north of Smiths Ferry on Idaho Hwy. 55 N/A not for publication

city or town Smiths Ferry x vicinity

state Idaho code ID county Valley code 085 zip code 83611

3. State/Federal Agency Certification

As the designated authority under the National Historic Preservation Act, as amended, I hereby certify that this X 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 X meets ___does not meet the National Register criteria. I recommend that this property be considered significant ___nationally X statewide ___locally. (___ See continuation sheet for additional comments.)

Robert M. Yohe II 2/22/99

Signature of certifying official/Title Date
ROBERT M. YOHE, II, State Historic Preservation Officer
Idaho State Historic Preservation Office

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 this property is:

X 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 Date of Action

4/2/99

North Fork Payette River Bridge
Name of Property

vic. Smiths Ferry, Valley County, Idaho
City, County, and State

5. Classification

Ownership of Property
(Check as many boxes as apply)

___ private
___ public-local
_x_ public-State
___ public-Federal

Category of Property
(Check only one box)

___ building(s)
___ district
___ site
_x_ structure
___ object

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

Contributing	Noncontributing	
		buildings
		sites
1	0	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

N/A

6. Function or Use

Historic Functions
(Enter categories from instructions)

TRANSPORTATION: vehicular

Current Functions
(Enter categories from instructions)

TRANSPORTATION: vehicular

7. Description

Architectural Classification
(Enter categories from instructions)

OTHER: reinforced concrete arch bridge

Materials
(Enter categories from instructions)

foundation CONCRETE
walls
roof
other

Narrative Description

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

_X_ See continuation sheet(s) for Section No. 7

8. Statement of Significance

Applicable National Register Criteria
(Mark "x" on one or more lines 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.

_x_ **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" on all 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, or 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

Period of Significance

1933

Significant Dates

1933

Significant Person
(Complete if Criterion B is marked above)

N/A

Cultural Affiliation

N/A

Architect/Builder

Charles A. Kyle, Engineer

Narrative Statement of Significance

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

_X_ See continuation sheet(s) for Section No. 8

9. Major Bibliographical 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 Buildings Survey # _____
___ recorded by Historic American Engineering Record # _____

Primary location of additional data:

_x_ State Historic Preservation Office
_x_ Other State agency, Idaho Transportation Dept.
___ Federal agency
___ Local government
___ University
___ Other

Name of repository:

_____

_X_ See continuation sheet(s) for Section No. 9

North Fork Payette River Bridge
Name of Property

vic. Smiths Ferry, Valley County, Idaho
City, County, and State

10. Geographical Data

Acreage of property less than one

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

	Zone	Easting	Northing
A	1/1	5/7/5/0/8/0	4/9/0/8/2/4/0
B	/	/ / / / /	/ / / / / /
C	/	/ / / / /	/ / / / / /
D	/	/ / / / /	/ / / / / /

Verbal Boundary Description
(Describe the boundaries of the property.)
The property is bounded by the exterior dimensions of the bridge, its supporting piers, and its rubble masonry approaches.

X See continuation sheet(s) for Section No. 10

Boundary Justification
(Explain why the boundaries were selected.)
The boundary is the minimum necessary to convey the bridge's historical significance as an engineering structure.

X See continuation sheet(s) for Section No. 10

11. Form Prepared By

name/title Donald W. Watts, Historic Preservation Planner
organization Idaho State Historic Preservation Office date 9/1/98
street & number 210 Main Street telephone (208)334-3861
city or town Boise state ID zip code 83702

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/or properties having large acreage or numerous resources.
- **Photographs:** Representative **black and white photographs** of the property.
- **Additional items** (Check with the SHPO or FPO for any additional items.)

Property Owner

name Idaho Transportation Department
street & number 3311 W. State Street telephone (208) 334-8000
city or town Boise state ID zip code 83707

NARRATIVE DESCRIPTION

The North Fork Payette River Bridge (most commonly known as Rainbow Bridge) is a skewed, open-spandrel, reinforced concrete arch structure spanning the North Fork of the Payette River approximately two and a half miles north of Smiths Ferry on Idaho Highway 55.[1]

In elevation, each of the two sides of the bridge is comprised of the following components, from south to north: four 25' girder spans, a 189' open spandrel arch, one 21' girder span, one 50' girder span over a railroad bed, and two 25' girder spans. The total length of the bridge is approximately 410 feet. The south end of the bridge is slightly curved until it reaches the first arch pier, then remains straight across the river and railbed. Approaches at each end of the bridge feature rubble masonry walls which provide an interesting visual contrast with the smooth concrete finish of the bridge itself. The skew results in the upstream side being off-set approximately 30 feet further north in relation to the downstream (Smiths Ferry) side.

The arch (comprised of two parallel ribs) provides a clearance of approximately 50 feet above the riverbed, and the 50-foot span over the rail line allows a 34-foot clearance above the tracks. The roadbed is 24 feet wide curb-to-curb and provides for two lanes of traffic. The maximum total width of the top deck (including piers) is 28 feet. In cross-section, the deck is cantilevered out by about 3 feet on each side. Concrete brackets support these overhangs.

The guardrail consists of simple arched openings supporting a rail 12" in width. The rail lengths correspond to the lengths of the girders beneath, and simple concrete panels join each of the separate guardrail segments.

Decorative elements include rail posts approximately 5 feet high incorporated in the guardrail above each of the four arch piers. Other decorative devices are simple indentations and protruberances molded into the concrete piers and posts (these decorative elements are referred to in original handwritten specifications as "dilly dallies").[2]

The deck surface was originally concrete, but asphalt has been the standard resurfacing material for decades. In the design sense, the bridge is virtually unaltered from its original construction. However, many years of wear, freeze/thaw cycles, and salting of the deck during winter has taken a severe toll on the concrete; the guardrail in particular exhibits extreme spalling and deterioration. The guardrail is scheduled for replacement in the near future.

Of its design, location and setting, a 1934 full-page article in the Idaho Statesman perhaps best sums up the visual impact of the bridge:

> Only too often the works of men in the wilderness are a blot on the landscape. Roads make great ugly scars through the forest; bridges are stark, graceless structures of red painted steel work. And with this in mind many people were privately concerned when it was announced that the state would build a bridge across the Payette River in the beautiful canyon above Smiths Ferry. . . . But they were needlessly concerned. The bridge now completed and ready for next summer's use is one of the most beautiful structures of any kind in the state. Its flowing lines of concrete, which will age to something approximating a weathered sandstone. Its curves melt into the contour of the surroundings with perfect harmony. Its suave approach lines and the sweep of its arch seem as if hewn out of native rock.[3]

The high visibility of the bridge from either approach, and its high traffic volume on the main road connecting north and south Idaho, has made Rainbow Bridge a popular landmark for decades.

STATEMENT OF SIGNIFICANCE

The North Fork Payette River Bridge is eligible for the National Register of Historic Places under Criterion C for its engineering design. The bridge is an open-spandrel concrete arch, a design which was introduced to Idaho in the 1920s and used in several locations and various scales throughout the state. Only a few concrete arch bridges have been built in Idaho, and some have been altered to the degree that they are no longer eligible for the Register. Rainbow Bridge survives as an excellent example of this aesthetically pleasing bridge form.

The earliest form of concrete bridge mimicked the stone masonry arch of ancient times -- a solid mass of concrete forming an arch with the roadbed located on top (deck). The structural limitations of the medium (concrete alone is very strong in compression force but very brittle in tension) required massive amounts of material. Tension weaknesses were overcome simply by using large quantities of concrete. The late-19th and early-20th centuries began to perfect the concept of adding steel reinforcement bars in the concrete; thus, compressive strength was retained and the steel bars provided the required tensile strength.

Pioneers in the use of reinforced concrete for bridge construction (such as Francois Hennebique of France and Robert Maillart of Switzerland) put Europe in the forefront of modern bridge design in the early years of the 20th-century. After the hostilities of World War I, the development and refinement of concrete arch bridge construction spread throughout Europe and North America.[4]

One of Maillart's considerable contributions was the refinement of the open spandrel concrete arch. For longer spans, it was found that open spandrels (an arch supporting several concrete pillars rising upward to support the roadbed) accomplished the needed engineering strength while saving considerable amounts of materials and, therefore, cost. In addition, rather than using one large wide arch to support the spandrels and deck across the entire bridge width, several thinner parallel arches, or "ribs," could achieve the necessary strength while, again, saving material. Thus, the open-spandrel, multi-ribbed, concrete arch bridge became a sound and economical engineering solution which spread rapidly during the 1920s and 1930s.

Both concrete and traditional steel truss bridges held their own set of economic advantages. One of the most important characteristics of steel truss bridges, and a major reason for their long-standing popularity, was their portability and relative ease of construction, particularly if there were a railhead nearby. A steel bridge could be fabricated

in Pittsburgh, for example, shipped overland in pieces to Boise, and erected at its final location. If it were a pin-connected structure, it could even be disassembled and moved elsewhere when its usefulness at its original site became outmoded.

Concrete bridge construction, on the other hand, had its own economic advantages in many situations. The availability of local materials such as sand and gravel could alleviate sometimes substantial shipping costs. Further, concrete construction usually required a less-skilled (less specialized) labor force. This meant not only wages could be saved but also workers could be drawn from the local labor supply by construction contractors. These two issues, availability of local materials and labor, were usually of considerable interest to the local community and its economy.

Concrete arch bridges can be subcategorized into two basic configurations -- the deck bridge which consists of the arch underneath supporting the roadbed on top and the rainbow bridge in which the arch rises above the roadbed creating a "through" structure.[5] The North Fork Payette River bridge is a deck bridge, so although known to generations as "Rainbow Bridge," it is not a true rainbow arch as defined by commonly accepted engineering terminology. Nevertheless, generations have come to know this structure as "Rainbow Bridge," and it is this moniker which has survived.

Rainbow Bridge was designed by Charles A. Kyle, the first Chief Bridge Engineer of the Bridge Division of the Idaho Department of Highways. He served in that capacity from the formation of the division in 1919 until his death in 1936. During his tenure, Kyle was instrumental in establishing the division as a leader in bridge design in the state, and he and his department set the standard for bridge construction in Idaho for decades. [6]

Construction of the bridge commenced in July 1933 and the structure completed in December of the same year. C. F. Dinsmore & Co. of Ogden, Utah, was the contracting firm (which had also built the Fairview Avenue Bridge in Boise the previous year), with Burton F. Dinsmore in direct charge of construction. Resident engineer was A. E. Hebert of the state bridge department staff. The total cost of the structure was about $74,000. On average, fifty-three men per day were on the job. The bridge construction itself was paid for through emergency relief funding from the federal government and was part of the much larger and longer-term construction and upgrade of the highway between Boise and McCall.[7] This highway link was a major effort to eliminate hazardous grades and obsolete bridges as well as to provide employment for the local economy during the Depression.

In the context of other concrete arch bridges in the state, Rainbow Bridge stands out as one of the most picturesque as well as historically intact structures. Other similar bridges

include: Salmon Bridge in Salmon (1926, major alteration in 1964), Washington Water Power Company Bridge near Post Falls (1929) [NRHP Ref. No. 96001507], Memorial Bridge in Boise (1931, widened in the 1980s) [NRHP Ref. No. 90001717], Fairview Avenue Bridge in Boise (1932, major alteration in 1976), Little Salmon River Bridge near New Meadows (1932), Dry Creek Bridge near Murtaugh (1934), and Upper West Branch Priest River Bridge near Priest River (1937). Although it is possible other historic concrete arch bridges remain in the state, no others appear in the Idaho Bridge Inventory.

Rainbow Bridge, the largest single-span concrete arch structure in Idaho, remains today as a major achievement and not only reflects the leading edge of bridge engineering of its time, but also exemplifies a conscious effort to meld a modern structure with a picturesque natural setting. The bridge's enduring popularity among residents and travelers alike is a tribute to its design.

BIBLIOGRAPHY

Bureau of Highways, Department of Public Works, State of Idaho; "Payette River Bridge and Overhead," File No. 478, Drawings #2050 - 2089 (various dates 1932-33). Includes miscellaneous letters and notes on microfiche.

Cascade News; Cascade, Idaho, June 23, 1933 through November 17, 1933.

Herbst, Rebecca; *Idaho Bridge Inventory*; Idaho Transportation Department; Idaho Historic Sites Inventory Report #17, 1983.

Hopkins, H. J.; A Span of Bridges: An Illustrated History (New York: Praeger Publishers), 1970.

Idaho Statesman; Boise, Idaho; "Where Engineers Have Enhanced Nature's Pristine Beauties;" February 25, 1934.

Jackson, Donald C.; Great American Bridges and Dams (Washington, D. C.: The Preservation Press), 1988.

ENDNOTES

1. Dimensions are from original engineering drawings (microfiche) cited in the Bibliography.

2. Idaho Transportation Department, Bridge File #478 (microfiche); handwritten notes describing Pier No. 1, dtd 2/3/33.

3. H. H. Miller, "Where Engineers Have Enhanced Nature's Pristine Beauties," *Idaho Statesman*, Section 2, p 1, February 25, 1934.

4. A good overview of the development of reinforced concrete bridge design can be found in H. J. Hopkins, A Span of Bridges: An Illustrated History, Ch. 6, "Bridges of Concrete."

5. Donald C. Jackson, Great American Bridges and Dams, p 37.

6. Idaho Bridge Inventory, Idaho Historic Sites Inventory Report #17.

7. *Idaho Sunday Statesman*, Feb 25, 1934, Section 1, p 1.