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UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICENATIONAL REGISTER OF HISTORIC PLACES
INVENTORY -- NOMINATION FORM

FOR NPS USE ONLY

RECEIVED

DATE ENTERED

SEE INSTRUCTIONS IN HOW TO COMPLETE NATIONAL REGISTER FORMS
TYPE ALL ENTRIES -- COMPLETE APPLICABLE SECTIONS

NAME

HISTORIC * Wheeling Suspension Bridge

AND/OR COMMON

LOCATION

Spans main Channel (East) of the Ohio River starting at 10th
STREET & NUMBER and Main Streets in Wheeling and running west to Wheeling Island.NOT FOR PUBLICATION
CONGRESSIONAL DISTRICT

CITY, TOWN

Wheeling

VICINITY OF

STATE

West Virginia

CODE
54COUNTY
OhioCODE
069

CLASSIFICATION

CATEGORY	OWNERSHIP	STATUS (not applicable)	PRESENT USE
<input type="checkbox"/> DISTRICT	<input checked="" type="checkbox"/> PUBLIC	<input type="checkbox"/> OCCUPIED	<input type="checkbox"/> AGRICULTURE <input type="checkbox"/> MUSEUM
<input type="checkbox"/> BUILDING(S)	<input type="checkbox"/> PRIVATE	<input type="checkbox"/> UNOCCUPIED	<input type="checkbox"/> COMMERCIAL <input type="checkbox"/> PARK
<input checked="" type="checkbox"/> STRUCTURE	<input type="checkbox"/> BOTH	<input type="checkbox"/> WORK IN PROCESS	<input type="checkbox"/> EDUCATIONAL <input type="checkbox"/> PRIVATE RES.
<input type="checkbox"/> SITE	<input type="checkbox"/> PUBLIC ACQUISITION	<input type="checkbox"/> ACCESSIBLE	<input type="checkbox"/> ENTERTAINMENT <input type="checkbox"/> RELIGIOUS
<input type="checkbox"/> OBJECT	<input type="checkbox"/> IN PROCESS	<input type="checkbox"/> YES: RESTRICTED	<input type="checkbox"/> GOVERNMENT <input type="checkbox"/> SCIENTIFIC
	<input type="checkbox"/> BEING CONSIDERED	<input checked="" type="checkbox"/> YES: UNRESTRICTED	<input type="checkbox"/> INDUSTRIAL <input checked="" type="checkbox"/> TRANSPORTATION
		<input type="checkbox"/> NO	<input type="checkbox"/> MILITARY <input type="checkbox"/> OTHER

OWNER OF PROPERTY

NAME State of West Virginia (West Virginia Department of Highways)

STREET & NUMBER

1900 Washington Street East

CITY, TOWN

Charleston

VICINITY OF

STATE

West Virginia

LOCATION OF LEGAL DESCRIPTION

COURTHOUSE,
REGISTRY OF DEEDS, ETC.

Ohio County Court

Deed: 10/12/42, Book 271

STREET & NUMBER

City-County Building, 1500 Chapline Street

CITY, TOWN

Wheeling

STATE

West Virginia

REPRESENTATION IN EXISTING SURVEYS

TITLE Historic American Engineering Record

DATE

1973-4

☒ FEDERAL ☐ STATE ☐ COUNTY ☐ LOCALDEPOSITORY FOR
SURVEY RECORDS

Library of Congress

CITY, TOWN

Washington, D.C.

STATE

DESCRIPTION

CONDITION		CHECK ONE	CHECK ONE
<input checked="" type="checkbox"/> EXCELLENT	<input type="checkbox"/> DETERIORATED	<input type="checkbox"/> UNALTERED	<input checked="" type="checkbox"/> ORIGINAL SITE
<input type="checkbox"/> GOOD	<input type="checkbox"/> RUINS	<input checked="" type="checkbox"/> ALTERED	<input type="checkbox"/> MOVED
<input type="checkbox"/> FAIR	<input type="checkbox"/> UNEXPOSED		DATE: _____

DESCRIBE THE PRESENT AND ORIGINAL (IF KNOWN) PHYSICAL APPEARANCE

As it stands today, the Wheeling Suspension Bridge has the general appearance of the original structure built in 1849. The massive towers, anchorage housings, and island approach are all the original stone masonry.

A 1953 report by the consulting engineers Howard, Needles, Tammen and Bergendorff indicates that the main cables of the bridge are either original or are additions dating from the 1860 reconstruction.

The date of the existing stiffening truss is unknown. It is a classic Howe timber truss with cast iron joint fittings and wrought iron vertical tension rods. It is likely that this truss dates from the 1860 reconstruction since it was a popular truss form of the period and also because several Ellet-inspired suspension bridges in West Virginia built in the 1850s employed similar trusses. In any case, these trusses can hardly be any later than the strengthening of the bridge which was undertaken in 1871-2.

The auxiliary stay cables were added at the time of the 1871-2 strengthening and followed a design by Washington Roebling. This effectively "Roeblingized" the bridge's appearance although the main cables and vertical suspenders were left unaltered. Washington Roebling and Wilhelm Hildenbrand, who undertook the strengthening project, also widened the distance between the cables and placed the walkways inside the stringers. This resulted in an improved lateral stiffness.

Changes to the deck made in 1922, 1930, and 1948 were largely superseded by a complete rebuilding of the deck in 1956. At that time, the roadway was widened from 16'3" to 20', while the sidewalks were correspondingly narrowed. The entire deck was constructed of steel with an open steel grating for both the walkway and the roadway. This grating rests on steel floor beams that were chosen in order to reduce the dead load and lessen wind resistance.

In spite of these changes, the bridge's present condition greatly resembles that described by the Wheeling City Directory of 1851:

The span is 1010 feet from the summit of tower to tower, leaving the entire width of the river unobstructed.

The summits of the towers on the eastern, or Wheeling shore are 153 1/2 feet above low water level of the river. Their actual height from the base of the stone work is 82 feet; abutment 22 feet, towers 60 feet.

The Western towers, on Zane's Island, are 132 3/4 feet; the abutment is 63 feet, and the columns of the towers 69 3/4 feet.

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The summits of the eastern towers are $21 \frac{3}{4}$ feet above the western towers.

The flooring is supported by twelve iron cables suspended from the towers, 10 large and 2 small ones. The large ones contain 550 strands of number ten wire, and the small ones 140 strands.

The cables are anchored by a succession of links, like those of a huge chain, into massive walls of masonry built under Main Street in Wheeling. Those at the west end are anchored in like manner in the wing walls extending from the abutment on the Island.

The cables are 1380 feet long from fastening to fastening. Their deflection below the top of the eastern tower is $68 \frac{1}{2}$ feet at a temperature of 44 degrees.

The flooring is attached to the cables by wire stays $\frac{3}{4}$ of an inch in diameter, (i.e. vertical suspender rods $\frac{3}{4}$ " diameter) varying in length as they approach and recede from the towers.

The highest elevation of the flooring is immediately over the channel of the river, 212 feet from the Wheeling shore, where the top of the flooring is a fraction over 93 feet above low water. The height from low water to the bottom of the flooring i.e. the lowest projecting timber, is $91 \frac{1}{2}$ feet, leaving that space, subject to the fluctuations in the depth of the channel, for the passage of steamboats and other vessels beneath.

The flooring ascends from the Wheeling side for $172 \frac{1}{2}$ feet at the rate of 1-28/100 feet in 100; thence it ascends forty feet more at the rate of 525/1000 feet in 100; thence it descends forty feet at the rate of 925/1000 feet in 100, and then descends to the western abutment at the rate of 4-08/100 in 100.

On top of the towers the cables rest on cast iron rollers which adapt themselves to any movements of the cables occasioned by changes of temperature or transitory loads.

The strength of the bridge, as computed by Mr. Ellet, is sufficient to resist 297 tons, or 32 heavily laden road wagons, 192 horses and 500 people, a weight equal to an army of 4000 men - a greater probable weight than it will ever be required to sustain.

SIGNIFICANCE

PERIOD	AREAS OF SIGNIFICANCE -- CHECK AND JUSTIFY BELOW			
<input type="checkbox"/> PREHISTORIC	<input type="checkbox"/> ARCHEOLOGY PREHISTORIC	<input type="checkbox"/> COMMUNITY PLANNING	<input type="checkbox"/> LANDSCAPE ARCHITECTURE	<input type="checkbox"/> RELIGION
<input type="checkbox"/> 1400-1499	<input type="checkbox"/> ARCHEOLOGY HISTORIC	<input type="checkbox"/> CONSERVATION	<input type="checkbox"/> LAW	<input type="checkbox"/> SCIENCE
<input type="checkbox"/> 1500-1599	<input type="checkbox"/> AGRICULTURE	<input type="checkbox"/> ECONOMICS	<input type="checkbox"/> LITERATURE	<input type="checkbox"/> SCULPTURE
<input type="checkbox"/> 1600-1699	<input type="checkbox"/> ARCHITECTURE	<input type="checkbox"/> EDUCATION	<input type="checkbox"/> MILITARY	<input type="checkbox"/> SOCIAL HUMANITIES
<input type="checkbox"/> 1700-1799	<input type="checkbox"/> ART	<input checked="" type="checkbox"/> ENGINEERING	<input type="checkbox"/> MUSIC	<input type="checkbox"/> THEATER
<input checked="" type="checkbox"/> 1800-1899	<input type="checkbox"/> COMMERCE	<input type="checkbox"/> EXPLORATION/SETTLEMENT	<input type="checkbox"/> PHILOSOPHY	<input type="checkbox"/> TRANSPORTATION
<input type="checkbox"/> 1900-	<input type="checkbox"/> COMMUNICATIONS	<input type="checkbox"/> INDUSTRY	<input type="checkbox"/> POLITICS/GOVERNMENT	<input type="checkbox"/> OTHER (SPECIFY)
		<input type="checkbox"/> INVENTION		

SPECIFIC DATES Completed 1849

~~BUILDER/ARCHITECT~~ Engineer: Charles Ellet, Jr.

STATEMENT OF SIGNIFICANCE

It can be argued that the Wheeling Suspension Bridge is the nation's most significant extant antebellum engineering structure and that America's preeminent position as a leader in the design and construction of long span suspension bridges began with its successful completion. At the time of building, and for many years thereafter, it was the longest suspension bridge in the world. It was the first bridge to be built across the Ohio River, one of the world's longest navigable streams, and provided a vital link in the National Road. It is the oldest major long span suspension bridge in the world with a span of more than 1000 feet, and is probably the oldest important bridge in the New World.

As a result of recent research, Charles Ellet, Jr., is emerging from obscurity and is being recognized as the father of the modern American suspension bridge and an engineer of true genius who was instrumental in proposing internal improvements in transportation, water resources, and flood control for the entire Mississippi - Ohio River system. In addition, Colonel Ellet was chiefly responsible for the defeat of the Confederate Naval Forces at the Civil War battle of Memphis as a result of his construction and command of the ram fleet. A wound received during the battle was fatal and cut short his brilliant career. The Wheeling Suspension Bridge stands as a fitting tribute to him.

As early as 1816 a charter was granted to the Wheeling and Belmont Bridge Company for the erection of a bridge at Wheeling, probably in anticipation of the arrival of the Cumberland Pike in 1818. Various factors combined to delay the building of this bridge, but by 1836 Ellet was in communication with Henry Moore of Wheeling on the subject and submitted to him a sketch of a possible bridge across the Ohio. There was a further delay, but on Mar 19, 1847, a new bridge charter was obtained and a new board of directors elected.

In May 1847, the directors sent invitations to both Ellet and John Roebling to present plans and cost estimates for a bridge across the east channel of the river to Wheeling Island. Their selection of these bidders indicates that they had already been influenced in favor of a suspension type of structure, doubtless for two reasons: the substantial saving in cost and

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freedom from pillars that could obstruct river traffic. Besides influencing the design, the directors also determined the approximate height of the bridge--90 feet above the river. The directors have sometimes been accused of gullibility in their handling of the engineering problems of the bridge, but to their credit it must be said that they were progressive enough and shrewd enough to choose the best of the four generic types of bridges (suspension, arch, cantilever, and truss) for their purpose. They should also be commended for offering the job to one of the two men in America capable of building a span of that size.

Ellet was awarded the contract and began construction in 1847. The bridge was completed in November 1849 amid great public acclaim. While it was a thing of considerable grace and beauty, it was not sufficiently stiffened to resist the cumulative motions resulting from the buffeting of high winds. On May 17, 1854, the structure was subjected to torsional movements and vertical undulations that tossed the flooring almost to the height of the towers. Except for some of the cables, the entire structure collapsed into the river. The bridge company, as indicated by its minutes and by newspaper accounts, summoned Ellet (not John Roebling, as an early biography has it) to rebuild the bridge temporarily and draw up a long-range plan for its reconstruction. Timidly, the directors suggested that Ellet might want to place a pier in the middle of the river. He did not follow their suggestion, but, with the help of Captain William K. McComas, superintendent, had a 14' wide version of the bridge functioning again on a one-way traffic basis within three months. This span was used until the summer of 1859 when McComas, now engineer as well as superintendent, rebuilt the bridge at a cost of between \$35,000 and \$40,000. There are indications that he incorporated Roebling principles into his revision. (He spent \$50 on a trip to Niagara Falls to study John Roebling's bridge across the gorge).

In a 1933 history of the bridge, T.R. Lawson, dean of RPI, states that McComas increased the number of wires of the bridge by a third, but reduced the number of cables from 12 to 4 (which were approximately 7 1/4" in diameter and were wrapped with No. 14 wire). During this 1859 rebuilding, McComas also added guy wires above and below the bridge on both river banks and placed wind guys at points along the platform. However, he placed the walks in an awkward position outside the suspenders. He was able to

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open his version of the bridge to traffic on a limited basis on July 20, 1860, and to all traffic on August 1, 1860.

A direct Roebling touch came in 1871 and 1872. Under a plan drawn up by Washington Roebling, Wilhelm Hildenbrand, engineer for the Roebling Company, and Joseph Lawson, superintendent, moved the cables farther apart and placed the sidewalks inside the suspenders. They also added a system of wire stays invented by Roebling. In 1886, Hildenbrand again went to work on the bridge, improving the flooring system in particular. Several more improvements have been made to the bridge, the last being an overhaul in 1960. Engineers predict a happy future for the structure.

MAJOR BIBLIOGRAPHICAL REFERENCES

- Kemp, Emory L., "Ellet's Contribution to the Development of Suspension Bridges," Engineering Issues, American Society of Civil Engineers, Vol. 99, No. PP3, July 1973.
- Lewis, Clifford M., "The Wheeling Suspension Bridge," West Virginia History, Vol. XXXIII, No.3, April 1972.
- Lewis, Gene D., Charles Ellet, Jr. (Urbana, IL).

GEOGRAPHICAL DATA

ACREAGE OF NOMINATED PROPERTY _____

UTM REFERENCES

A 117 523250 4435550
ZONE EASTING NORTHING
C

B
ZONE EASTING NORTHING
D

VEREAL BOUNDARY DESCRIPTION

LIST ALL STATES AND COUNTIES FOR PROPERTIES OVERLAPPING STATE OR COUNTY BOUNDARIES

STATE	CODE	COUNTY	CODE
STATE	CODE	COUNTY	CODE

FORM PREPARED BY

NAME: TITLE

Dr. Emory L. Kemp

February 1975

ORGANIZATION

Department of Civil Engineering

DATE

STREET & NUMBER

West Virginia University

TELEPHONE

304-293-3031

CITY OR TOWN

Morgantown

STATE

West Virginia

STATE HISTORIC PRESERVATION OFFICER CERTIFICATION

THE EVALUATED SIGNIFICANCE OF THIS PROPERTY WITHIN THE STATE IS:

NATIONAL

STATE

LOCAL

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

FEDERAL REPRESENTATIVE SIGNATURE

TITLE

DATE

FOR NPS USE ONLY

I HEREBY CERTIFY THAT THIS PROPERTY IS INCLUDED IN THE NATIONAL REGISTER

DATE

DIRECTOR, OFFICE OF ARCHEOLOGY AND HISTORIC PRESERVATION
ATTEST

DATE

KEEPER OF THE NATIONAL REGISTER

UNITED STATES DEPARTMENT OF THE INTERIOR
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PROPERTY MAP FORM

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SEE INSTRUCTIONS IN *HOW TO COMPLETE NATIONAL REGISTER FORMS*
TYPE ALL ENTRIES -- ENCLOSE WITH MAP

☒ NAME

HISTORIC Wheeling Suspension Bridge

AND/OR COMMON

☒ LOCATION

CITY, TOWN Wheeling

____ VICINITY OF

COUNTY
Ohio

STATE
West Virginia

☒ MAP REFERENCE

SOURCE U.S. Geological Survey

SCALE 1:24000

DATE 1968

☒ REQUIREMENTS

TO BE INCLUDED ON ALL MAPS

1. PROPERTY BOUNDARIES

2. NORTH ARROW

3. UTM REFERENCES

INT: 2986-75

THE WHEELING BELMONT BRIDGE COMPANY PAPERS

On file at

The Oglebay Institute Mansion Museum

As of December 13, 1980

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February 1816:

Charter of the Wheeling & Belmont Bridge Company

March 1838:

Rep. No. 993

1847:

Photograph of Wheeling & Belmont Bridge Company Seal

1847:

Correspondence: Bridge Co. to Daniel Zane

1847:

Proposals for stone work

March 1847:

Reincorporation papers of the W. B. B. Co.

June 1847:

Specifications by Roebling

July 1847:

Specifications by Ellet

July 1847:

Ellet & W. B. B. Co. Contract

August 1847:

Stone Contract w/ Hugh Crolley

August 2, 1847

Report on the Committee on Tolls

August 26, 1847:

City of Wheeling & W. B. B. Co. grant to use Madison Street for anchors to the bridge

September 1847:

Contract for East Abutment

Kelly & Miller

Relinquished November 17, 1847

September 1847:

Contract for the Iron Work

D. Richards & Company

October 9, 1847

Correspondence between Dorsey and Board

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November 1847:
Bill of Sale for the Steam Boat Miner

April 1847:
Dorsey & Bridge Co. Agreement

1848:
Proposals for Lumber Supplies

April 1848:
Contract for Anchor Bars w/ Rogers and Spears

July 1848:
Contract for supply of lumber w/ Chester & Henry Hubbard

July 21, 1848:
City of Wheeling & Bridge Company Contract
"In Relation to the Occupancy of Madison Street"

October 1848:
Contract for Bolts "and other iron work" w/ J. Mackie

June 1850:
Contract w/ Mastin & Haley

1851
Supreme Court Case Decision (three copies w/ illustrations)

January 1852:
Correspondence Ellet to George W. Thompson

1854:
Copy of the Charter of the W. B. B. Co.

April 9, 1856:
Correspondence David Zorn to L. Zorn

June 21, 1862:
History of Colonel Chas. Ellet

1869:
Declaration of Free Toll for Zane & Crammer

July 25, 1871
Citizen's Railway Co. to W. B. B. Co.

April 1872:
Indenture between W. B. B. Co. and Pittsburgh, Wheeling & Kentucky Railroad

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December 1874:

N. B. B. Co. agreement with City of Wheeling for supply of gas

August 1879:

Proposed improvements to Suspension Bridge by W. Hildenbrand

1879

Reprint from: The Industries of Wheeling Review

May 14, 1883

Appraisal of damage to bridge by fire

May 12, 1883

July 1886 and 1888

Contract w/ Natural Gas Company of N. Va.

April 1891

Comments on the bar below the bridge

January 1893

Repairs made by the Wrought Iron Bridge Company

November 1893

Correspondence w/ Pennsylvania Lines

January 1894

Debate on the Tolls

May 1898

Correspondence w/ Wheeling Electric

August 1901

Request for permission to install telephone lines on the Back River Bridge

August 1902

Schaeubra Abutment

January 13, 1926

Wheeling Bridge Co. Reports & Statements

July 1928

Baird and Lawson Report

August 1928

Inspection Report at the Suspension Bridge by Baird, Lawson and Smith

1930

Photograph of "Lawson's Crew"

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September 1933
Purchase of Large Incandescent Lamps

Undated Materials:

Miscellaneous Certificates of Stock

Miscellaneous Letters from Charles Ellet

Toll House Repairs

Nicholas and W. B. B. Co. Agreement

Wheeling

Island

MADISON

Drive-in
Theater

Stadium

Doors

Riverview

Wheeling Suspension Bridge

Spans E channel of Ohio River
starting at 10th & Main Streets in
Wheeling and running W to

Wheeling Island

U.S.G.S. 1:25000 Series

Wheeling, W. Va. - Ohio quad

17.523250.4435550

WHEELING

CENTER

WEBSTER

RITCHIE

WASHINGTON

Fulton

Glenwood

Woodsdale

Mt de Central
Academy

Water

WHEELING

CENTER

WEBSTER

RITCHIE

WASHINGTON

Fulton

Glenwood

Woodsdale

Mt de Central
Academy

Water

