Form No. 10-300 (Rev. 10-74)

UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

NATIONAL 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

1 NAME

HISTORIC: Wheeling Suspension Bridge

AND/OR COMMON:

2 LOCATION

STREET & NUMBER: Spans main Channel (East) of the Ohio River starting at 10th and Main Streets in Wheeling and running west to Wheeling Island.

__NOT FOR PUBLICATION

CITY, TOWN: Wheeling __ VICINITY OF

CONGRESSIONAL DISTRICT:

STATE: West Virginia CODE: 54 COUNTY: Ohio CODE: 069

3 CLASSIFICATION

CATEGORY	OWNERSHIP	STATUS	PRESENT USE	
__DISTRICT	X PUBLIC	__OCCUPIED	__AGRICULTURE	__MUSEUM
__BUILDING(S)	__PRIVATE	__UNOCCUPIED	__COMMERCIAL	__PARK
X STRUCTURE	__BOTH	__WORK IN PROGRESS	__EDUCATIONAL	__PRIVATE RESIDENCE
__SITE	**PUBLIC ACQUISITION**	**ACCESSIBLE**	__ENTERTAINMENT	__RELIGIOUS
__OBJECT	__IN PROCESS	__YES: RESTRICTED	__GOVERNMENT	__SCIENTIFIC
	__BEING CONSIDERED	X YES: UNRESTRICTED	__INDUSTRIAL	X TRANSPORTATION
		__NO	__MILITARY	__OTHER:

(not applicable)

4 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

5 LOCATION OF LEGAL DESCRIPTION

COURTHOUSE, REGISTRY OF DEEDS, ETC.: Ohio County Court — Deed: 10/12/42, Book 271, P. 255

STREET & NUMBER: City-County Building, 1500 Chapline Street

CITY, TOWN: Wheeling STATE: West Virginia

6 REPRESENTATION IN EXISTING SURVEYS

TITLE: Historic American Engineering Record

DATE: 1973-4 X FEDERAL __STATE __COUNTY __LOCAL

DEPOSITORY FOR SURVEY RECORDS: Library of Congress

CITY, TOWN: Washington, D.C. STATE:

7 DESCRIPTION

CONDITION		CHECK ONE	CHECK ONE
X EXCELLENT	__DETERIORATED	__UNALTERED	X ORIGINAL SITE
__GOOD	__RUINS	X ALTERED	__MOVED DATE_____
__FAIR	__UNEXPOSED		

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.

8 SIGNIFICANCE

PERIOD	AREAS OF SIGNIFICANCE -- CHECK AND JUSTIFY BELOW				
__PREHISTORIC	__ARCHEOLOGY-PREHISTORIC	__COMMUNITY PLANNING	__LANDSCAPE ARCHITECTURE	__RELIGION	
__1400-1499	__ARCHEOLOGY-HISTORIC	__CONSERVATION	__LAW	__SCIENCE	
__1500-1599	__AGRICULTURE	__ECONOMICS	__LITERATURE	__SCULPTURE	
__1600-1699	__ARCHITECTURE	__EDUCATION	__MILITARY	__SOCIAL/HUMANITARIAN	
__1700-1799	__ART	X ENGINEERING	__MUSIC	__THEATER	
X 1800-1899	__COMMERCE	__EXPLORATION/SETTLEMENT	__PHILOSOPHY	__TRANSPORTATION	
__1900-	__COMMUNICATIONS	__INDUSTRY	__POLITICS/GOVERNMENT	__OTHER (SPECIFY)	
		__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 its 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 March 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 substanial saving in cost and the

9 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).

10 GEOGRAPHICAL DATA

ACREAGE OF NOMINATED PROPERTY _____

UTM REFERENCES

	ZONE	EASTING	NORTHING
A	17	523250	4435550
B			
C			
D			

VERBAL BOUNDARY DESCRIPTION

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

STATE	CODE	COUNTY	CODE
STATE	CODE	COUNTY	CODE

11 FORM PREPARED BY

NAME / TITLE
Dr. Emory L. Kemp

DATE
February 1975

ORGANIZATION
Department of Civil Engineering

STREET & NUMBER
West Virginia University

TELEPHONE
304-293-3031

CITY OR TOWN
Morgantown

STATE
West Virginia

12 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

The summits of the eastern towers are 21 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 1/2 feet at a temperature of 44 degrees.

The flooring is attached to the cables by wire stays 3/4 of an inch in diameter, (i.e. vertical suspender rods 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 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 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 for 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.

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 Niagra 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

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 1956. Engineers predict a happy future for the structure.