HISTORIC HEELING

SUSPENSION BRIDGE

AND: NO.

LOCATION

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

CITY, TOWN

Wheeling

STATE

West Virginia

CLASSIFICATION

CATEGORY

X DISTRICT

OWNERSHIP

PUBLIC

STATUS (not applicable)

AGRICULTURE

PRESENT USE

COMMERCIAL

EDUCATIONAL

PRIVATE

ENTERTAINMENT

RELIGIOUS

GOVERNMENT

INDUSTRIAL

SCIENTIFIC

MILITARY

OTHER

OWNER OF PROPERTY

NAME

State of West Virginia (West Virginia Department of Highways)

STREET & NUMBER

1900 Washington Street East

CITY, TOWN

Charleston

STATE

West Virginia

LOCATION OF LEGAL DESCRIPTION

COURTHOUSE

Ohio County Court

REGISTRY OF DEEDS ETC

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

DEEDS FOR

Library of Congress

SURVEY RECORDS

CITY, TOWN

Washington, D.C.
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 1850 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 1860s 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Changes to the deck made in 1922, 1930, and 1948 were largely superseded by a complete rebuilding of the deck in 1955. 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; the 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.
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 14' lengths in the wing walls extending from the abutments on the island.

The cables are 1300 feet long from fastening to fastening. Their deflection below the top of the eastern tower is 63 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 suspenders 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 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.
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 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 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 substantial saving in cost and
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 1851 and great public acclaim went to it as 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
open his version of the bridge to traffic on a limited basis on July 20, 1850, 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 Laueon, 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 agreed 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 1968. Engineers predict a happy future for the structure.
MAJOR BIBLIOGRAPHICAL REFERENCES


Lewis, Gene D., Charles Ellet, Jr. (Urbana, IL).

GEOGRAPHICAL DATA

ACREAGE OF NOMINATED PROPERTY

UTM REFERENCES

A 1, 7 5 1, 3 2, 5, 0 4, 3 1, 3 5, 5, 0

ZONE EASTING NORTHING

B

C

D

ZONE EASTING NORTHING

VERBAL 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

STREET & NUMBER

West Virginia University

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

OWNERS USE ONLY

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

DATE

DIRECTOR, OFFICE OF ARCHAEOLOGY AND HISTORIC PRESERVATION

DATE

ATTACH

DATE

KEEPER OF THE NATIONAL REGISTER
NAME
HISTORIC Wheeling Suspension Bridge

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
February 1846:
Charter of the Wheeling & Belmont Bridge Company

March 1847:
Rep. No. 999

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. E. 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
E. Richards & Company

October 9, 1847:
Correspondence between Dorsey and Board
November 1847:
Bill of Sale for the Steam Boat Miner

April 1847:
Corseay & Bridge Co. Agreement

1847:
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/ Hastin & 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

1870:
Declaration of Free Toll for Lane & Crammer

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

April 1872:
Incurrence between W. B. B. Co. and Pittsburgh, Wheeling & Kentucky Railroad
December 1874:
N. E. B. Co. agreement with City of Wheeling for supply of gas

August 1877:
Proposed improvements to Suspension Bridge by W. Hildenbrand

1891:
Reprint from The Industries of Wheeling Review

May 11, 1893
Appraisal of damage to bridge by fire
May 12, 1893

July 1896 and 1898
Contract w/ Natural Gas Company of W. 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 Buck River Bridge

August 1902
Schnebbar Abutment

January 15, 1926
Wheeling Bridge Co. Reports & Statements

July 1926
Fairb and Lawson Report

August 1928
Inspection Report at the Suspension Bridge by Fairb, Lawson and Smith

1930
Photograph of "Lawson's Crew"
September 1933
Purchase of Large Incandescent Lamps

Related Materials:
Miscellaneous Certificates of Stock
Miscellaneous Letters from Charles Ellet
Toll House Repairs
Nicholas and W. B. P. Co. Agreement
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. 1:24000 Survey
Wheeling, W. Va. - Ohio quad
17.523250 44.35550