NPS Form 10-900a
(8-86)

OMB No. 1024-0018

United States Department of the Interior
National Park Service

NATIONAL REGISTER OF HISTORIC PLACES CONTINUATION SHEET

Section _____ Page ___

SUPPLEMENTARY LISTING RECORD

NRIS Reference Number: 05000639 Date Listed: 7/1/2005

Willamette River (Oregon City) Bridge No. 357 — Property Name
Clackamas — County
OR — State

N/A — Multiple Name

This property is listed in the National Register of Historic Places in accordance with the attached nomination documentation subject to the following exceptions, exclusions, or amendments, notwithstanding the National Park Service certification included in the nomination documentation.

Signature of the Keeper — Date of Action: 7/1/05

Amended Items in Nomination:

Significance:

The nomination is amended remove *Transportation* as an area of significance.
[Bridges nominated under Criterion C are normally eligible under Engineering. Transportation relates more to historic function than significance in the case for the Willamette River Bridge.]

The level of significance is: *Statewide.*
[The SHPO certification incorrectly noted local level, while the narrative supports state level.]

Acreage/Boundary:

The correct acreage for the bridge property is: *less than one acre*
Verbal Boundary Description should read: *The boundary is a rectangle approximately 745' x 31', centered on the bridge span, encompassing the full extent of the bridge, bridge abutments, piers, and approach spans.*

These clarifications were confirmed with the OR SHPO office.

DISTRIBUTION:
National Register property file
Nominating Authority (without nomination attachment)

NPS Form 10-900
0018
(Oct.1990)

OMB No. 10024-

United States Department of the Interior
National Park Service

National Register of Historic Places Registration Form

This form is for use in nominating or requesting determinations for individual properties and districts. See instruction in How to Complete the National Register of Historic Places Registration 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 classifications, 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 Willamette River (Oregon City) Bridge (No.357)
other names/site number Oregon City Bridge; Oregon City-West Linn Bridge

2. Location

street & number Spanning the Willamette River on Oswego Highway 3(ORE-43) between Oregon City and West Linn
city or town Oregon City and West Linn
vicinity

state Oregon code _____ county Clackamas code 05 zip code 97405

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 ____ statewide X locally.

James Hamrick — 17 May 2005
Signature of certifying official/Title -- Deputy SHPO — Date

Oregon State Historic Preservation Office
State or Federal agency and bureau

4. National Park Service Certification

I hereby certify that the property is:

Action — Signature of the Keeper — Date of

✓ entered in the National Register — 7/1/05
___ 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):

Willamette River Bridge (Oregon City)
Name of Property

Clackamas County : Oregon
County and State

5. Classification

Ownership of Property
(check as many 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: Road-related/Bridge

Current Functions
(Enter categories from instructions)

Transportation: Road-related/Bridge

7. Description

Architectural Classification
(Enter categories from instructions)

Half through arch bridge.

Materials
(Enter categories from instructions)

foundation: ____
walls: ____
____
roof: ____
Other: The bridge is made of reinforced concrete and gunite covered steel box girders.

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

See continuation sheets.

Willamette River Bridge (Oregon City)
Name of Property

Clackamas County:Oregon
County and State

8. Statement of Significance

Applicable National Register Criteria
(Mark "x" in one or more boxes 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.

Areas of Significance
(Enter categories from instructions)

Engineering
Transportation

Period of Significance

1922

Significant Dates

Dec. 28, 1922 Date of Dedication

Criteria Considerations
(Mark "x" in all the boxes 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

Significant Person
(Complete if Criterion B is marked above)

Cultural Affiliation

Architect/Builder

Engineer: Conde B. McCullough
Contractor: A. Guthrie & Co. Portland

Narrative Statement of Significance
(Explain the significance of the property on one or more continuation sheets)

9. Major Bibliographical References

Bibliography (Cite books, articles, and other sources used in preparing the form on one or more continuation sheets) See continuation sheets

Previous documentation on file (NPS):
___ preliminary determination of individual listing (36CFR67) 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
__X__ recorded by Historic American Engineering Record

Primary location of additional data:
___ State Historic Preservation Office
__X__ Other State agency
___ Federal agency
___ Local government
___ University
___ Other
Name of repository: ODOT Archives

Willamette River Bridge (Oregon City : Oregon)
Name of Property

Clackamas County : Oregon
County and State

10. Geographical Data

Acreage of Property N/A

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

	Zone	Easting	Northing
1	10	530656	5022726
2			
3			
4			

Verbal Boundary Description
(Describe the boundaries of the property on a continuation sheet)

Boundary Justification
(Explain why the boundaries were selected on a continuation sheet)

11. Form Prepared By

name/title James A. McNett

organization University of Oregon Preservation Student date June 4, 2004

street & number 3566 Black Oak Road telephone 1.541.345.1881

city or town Eugene state Oregon zip code 97405

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 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 State of Oregon Department of Transportation Contact: Robert W. Hadlow : Senior Historian

street & number 123 NW Flanders telephone 1.503.731.8239

city or town Portland state Oregon zip code 97209

NPS Form 10-900-a
OMB Approval No. 1024-0018

United States Department of the Interior
National Park Service

National Register of Historic Places Continuation Sheet

INTRODUCTION

The Willamette River Bridge, completed in 1922, was designed by the state bridge engineer, Conde B. McCullough, for the Oregon State Highway Department (OSHD) later named the Oregon Department of Transportation (ODOT). The half-through arch bridge, one of four in Oregon, crosses the Willamette River between Oregon City and West Linn and is one of the major spans along the Oregon section of the old Pacific Highway which went from Canada to Mexico.

The dramatic bridge location presented difficult engineering problems for the designer and the ultimate solution is considered a masterwork of McCullough's first period immediately after he assumed the position of chief bridge engineer at OSHD in 1919. The Willamette River Bridge contains unique engineering solutions as well as aesthetic motifs that became part of McCullough's design vocabulary. Although Interstate Highway 205 has become the major route over the Willamette in this location; the bridge is still heavily used by local residents. The Willamette River Bridge is listed in the Historic American Engineering Record as HAER-31 Oregon, which was completed in 1990.

LANDSCAPE AND SETTING

"... this bridge fits well the natural beauty of the setting in which it lies."[1]

This quote is from the brochure prepared for the dedication of the Willamette River Bridge on December 28, 1922. Since that dedication, the bridge has been part of the

[1] Opening of the Willamette River Bridge, Oregon City Enterprise, 1922.

NPS Form 10-900-a
OMB Approval No. 1024-0018

United States Department of the Interior
National Park Service

National Register of Historic Places Continuation Sheet

city landscape and still provides great impact and surprise for the motorist due to the extremely steep cliffs which makes one approach the bridge at an angle rather than on axis. The site location also gives motorists the opportunity to view the bridge in elevation from the roadway which runs parallel to the river.

The Willamette River Bridge is located below the Willamette Falls between Oregon City and West Linn, one of the earliest settlements in Oregon. The area has significant historical meaning of which the routing of the Pacific Highway, which connected Canada and Mexico, is but one part. The bridge spans a deep uneven cleft from the lower Oregon City side (elev.60) to the substantially higher West Linn side (elev.105) The height of the roadway at the center of the span (elev.83) can be between 51 and 75 feet above the level of the river below. The bridge roadway maintains a consistent 5% slope between Oregon City and West Linn. The slope, coupled with the graceful parabolic central through-arches which contain the roadway within them, connects the two basaltic cliffs with two thin lines - the structural arch of the bridge and the slanting line of the roadway it supports.

Although the bridge is designed for vehicular traffic, it also serves as a connector pathway and view platform for the pedestrian. The walkways on both sides frame views to Oregon City, West Linn, the Willamette Falls, and the Willamette River. The pylon-obelisks mark the entries and the location of the restrooms which were located within the central piers of the bridge. The restroom entry stairs have been covered with concrete and now serve as viewing areas off of the main walkway.

NPS Form 10-900-a
OMB Approval No. 1024-0018

United States Department of the Interior
National Park Service

National Register of Historic Places Continuation Sheet

Because the highest point of structure is only thirty feet above the roadway, the bridge does not divulge its structural prowess while crossing; it is only when the bridge is viewed in elevation can one comprehend the great span over the river. The bridge, while heavily trafficked, provides an intimate experience.

CHARACTERISTICS: GENERAL

Although the bridge appears to be a through arch reinforced concrete structure, the main arches are in fact steel box beams covered with gunite. The bridge is 745 feet long with two half through steel box arches that span 360 feet measured from the centerlines of the two main supporting piers which are located on basalt bedrock cliffs that flank the river. Heading from the West Linn side to the Oregon City side the bridge has six 35-foot reinforced concrete deck girder spans, one 360 foot through arch , one 70 foot I-beam span and, three 35 foot reinforced concrete deck girders spans. The overall width of the bridge is 30'6", which includes two lanes of traffic (19'0" clear) and two cantilevered 5'9" walkways. The roadway and the walkway widths are maintained although the walkways flair around the two through arches at the central span. The main arches of the bridge are 100 feet tall measured from their spring points on either side of the river, and the top of the arches are 30 feet above the roadway. The original bridge log indicated a horizontal clearance of 17'5" with a vertical clearance of 15'0". These original dimensions were changed in the field to provide a larger crown in the roadway and the present clearances have been reduced.

NPS Form 10-900-a
OMB Approval No. 1024-0018

United States Department of the Interior
National Park Service

National Register of Historic Places Continuation Sheet

CHARACTERISTICS: STRUCTURE

Central Span:

The Willamette River Bridge has two, 360 foot long and 100 feet high, central half through arches made of steel box girders which are encased in gunite, a mixture of cement sand and water applied through a hose. The gunite method was used to apply a thin 1 ½ inch coating of concrete over the steel in order to protect it from sulfur dioxide fumes generated by adjacent pulp and paper mills. The central arches were assembled in pieces with the segments hinged on both piers. The assembly process was facilitated by using the then-existing suspension bridge cables to place and stay the box sections. A framework was constructed and suspended from the cables; it was then loaded with the boxed sections in order to duplicate the ultimate load on the arches. Each arch was," erected as a three-hinged arch, the hinges are replaced after erection by through splices."[2] The first thirty feet of the boxed girders were then filled with concrete.

In order to save time and money, as well as minimize the visual impact of the box girders, McCullough chose to encase them with gunite. He covered the interior of the girders with a ¾ inch coating and the exterior with a 1- ½ inch covering sprayed over a steel mesh that had been welded to rebars. The exterior gunite was covered with a ¼ inch float coat[3] which was then finished to a similar level as the rest of the exposed concrete.

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[2]Conde B. McCullough, "Old Suspension Bridge Used in Erecting New Arch," *Engineering News-Record*, Vol.89 No.18 (November 1922): 730-733.

[3] Conde B. McCullough, "Large Steel Arch Bridge Ribs Encased in Gunite," *Engineering News-Record*, Vol.88 No.23 (June 1922): 945.

NPS Form 10-900-a
OMB Approval No. 1024-0018

United States Department of the Interior
National Park Service

National Register of Historic Places Continuation Sheet

The Willamette River Bridge was the first gunite encased box-steel arch bridge[4] and is one of only four half-through arch designs[5] in Oregon.

Approaches:

Heading from the West Linn side to the Oregon City side the bridge has six 35-foot reinforced concrete deck girder spans with open spandrels which rest on reinforced concrete columns. Heading from the Oregon City side to the West Linn side there is one 70 foot I-beam span and three 35 foot reinforced concrete deck girder spans with open spandrels which also rest on reinforced concrete columns. The I-beam replaced two 35 foot reinforced concrete deck girders that were part of the original design but had to be changed in order to span a new roadway that went below the Oregon City approach.

Roadway and walkways:

The overall width of the bridge is 30'6", which includes two lanes of traffic (19'0" clear) and two cantilevered 5'9" walkways. The roadway and the walkway widths are maintained although the walkways flair around the two through arches at the central span. The roadway within the arches is supported by concrete encased steel hangers 24 inches square which are attached to 26 inch deep floor beams. The beams and stringers support a 6 inch reinforced concrete roadway slab which has two inches of paving on

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[4] Robert W. Hadlow, *Elegant Arches, Soaring Spans: C.B. McCullough. Oregon's Master Bridge Builder* (Corvallis: OSU Press, 2001), 53.

[5] Dwight A. Smith et al., *Historic Highway Bridges of Oregon* (Portland: Oregon Historical Society Press, 1989), 96.

top. All of the unexposed steel elements are covered with ¾ inch of gunite. The roadway that rests on top of the arch sits on top of concrete encased steel posts that have a finished dimension of 24 x 30 inches. The posts support floor beams and stringers which in turn support the roadway slab.

The walkways are cantilevered and supported by brackets attached to the roadway deck for the entire length of the approaches. For the entire length of the half-through arch the walkways are supported by a spandrel beam which is in turn supported by the main floor beams. The balusters and top piece of the handrail are precast concrete.

Arch Piers:

The arch piers are set in basaltic bedrock on both sides of the river and are constructed of reinforced concrete. Unique for a McCullough bridge, the piers contain public restrooms. "Under each pier provision is made for comfort stations and observation balconies which are entered from the floor elevation by stairways leading from the upper balcony".[6] These restrooms have been closed since the 1930s and the windows and stairway entrances have been covered with concrete.

CHARACTERISTICS: AESTHETICS

Finishes:

The Willamette Bridge has many aesthetic refinements that occur regularly in the work of Conde B. McCullough. The most typical is the overall finished appearance of the concrete work. He took great care to grind or sand the concrete smooth to give a

[6] Conde B. McCullough, "Large Steel Arch Bridge Ribs Encased in Gunite", *Engineering News-Record*, Vol.88, No.23 (June 1922), 945.

NPS Form 10-900-a
OMB Approval No. 1024-0018

United States Department of the Interior
National Park Service

National Register of Historic Places Continuation Sheet

uniform appearance. He also used bush hammering to accentuate the smoothness of the surrounding concrete as well as provide shadow and pattern. He added a top ¼ inch coat to the gunite finish which was sanded and finished to the same extent as the regular reinforced and precast concrete. The effect was stunning.

Entry Obelisks:

The Willamette Bridge marks the first use by McCullough of entry and "marker" obelisks. The obelisks, which formerly contained lights, were added after the drawings were completed. In this case, as in his later work, the obelisks announce the entry and special structural points (the piers) of the bridge.

Scale / Traditional Forms:

McCullough respected scale and balance in his designs and chose to express his structure as clearly as possible. This is the reason that he cantilevered walkways so the edge was minimized and wouldn't conflict with the line of the main structure. He also relied on the use of traditional forms, such as arches, to create bridges that although created in the latest technology, were still recognizable and comforting to the user. In the case of the Willamette River Bridge he purposely wanted to cover the steel box girders so the elements would look like reinforced concrete and appear substantial to the motorist.

NPS Form 10-900-a
OMB Approval No. 1024-0018

United States Department of the Interior
National Park Service

National Register of Historic Places Continuation Sheet

ALTERATIONS AND ADDITIONS

The bridge is almost entirely as designed except for the closing of the public restrooms in the 1930's due to vandalism. The restroom windows and stairwells were subsequently covered in concrete. The lights that were attached to the obelisks were removed at an uncertain date and never replaced. A series of utility lines that run between the piers on the Willamette Falls side have been located under the walkway and covered with a crude uneven skirt that diminishes the lightness of the former profile. Heavy timber bumpers which protect the lower edges of the arches from floating debris are also in need of replacement. The bridge is scheduled for ODOT maintenance and rehabilitation in 2008-2009 which will include replacing the lights, repairing the concrete and gunite covering, replacing the bumpers, and mitigating the impact of the utility skirt.

SUMMARY

The Willamette River Bridge, and the two areas which it connects, West Linn and Oregon City, have remained substantially unchanged since the dedication of the bridge on December 28, 1922. This is one of the first and most beautiful of McCullough's large spans.

NPS Form 10-900-a
OMB Approval No. 1024-0018

United States Department of the Interior
National Park Service

National Register of Historic Places Continuation Sheet

Section number 8 Page 1

INTRODUCTION

The Willamette River Bridge, spanning the Willamette River on Oswego Highway 3 (ORE-43), between West Linn and Oregon City, is eligible for listing in the National Register of Historic Places as a structure under Criterion C for its type, period, materials, and method of construction. The bridge, completed in 1922, is a master work of Oregon State Highway Department's bridge engineer Conde B. McCullough and has statewide significance. The bridge is closely associated with the highway history of Oregon and the Pacific Northwest. The period of significance is the 1922 completion date of the bridge.

HISTORIC CONTEXT

Oregon City, site of the Willamette River Bridge, is located southeast of Portland below the Willamette River falls. The historic context statement prepared by the city states that it was one of the first (founded in 1829) Euro-American settlements in the Willamette Valley and in 1844, became the first incorporated city west of the Rocky Mountains. Because it is the end of the Oregon Trail, Oregon City became an interim point for travelers to stop while they determined where they would settle in the Oregon Territory. The location of the Willamette falls made power for milling readily available and soon sawmills, flour mills, and woolen mills appeared along the falls. Oregon City was the capital of the Oregon Territory from 1848 until 1852 when it was relocated to Salem.

West Linn, located across the river from Oregon City, was incorporated in 1913. West Linn includes the site of the Willamette Transportation Locks Company which has been in operation since 1868, and the former site of Linn City which was wiped out during the

NPS Form 10-900-a
OMB Approval No. 1024-0018

United States Department of the Interior
National Park Service

National Register of Historic Places Continuation Sheet

flood of 1861[1]. West Linn residents worked in many of the industrial sites in the Oregon City area. The city has grown steadily since incorporation and today is roughly the same size as Oregon City.

In 1869, the Oregon and California Railroad arrived in Oregon City and eventually extended to Roseburg. The railroad connected the Willamette Valley to shipping ports and new industries such as pulp and paper mills could also rely on the railroads for shipping. They soon became the largest employers in what became one of the most heavily industrialized areas in Oregon. The West Linn - Oregon City suspension bridge, completed in 1888, linked both sides of the river and provided easy access for workers to the mills located in Oregon City. In 1889, the Willamette Falls Electric Company, for the first time in the United States, transmitted power long distance to the city of Portland. The first interurban electric railway in Clackamas County soon followed and permitted commuters to work in Portland and live in Oregon City.

The growing popularity of the automobile further changed the face of Oregon City. In 1917, the State Highway Fund was created based on revenues from publicly endorsed bond issues. In 1919, Oregon passed the first state gas tax and a steady source of revenues for highway building was in place. Part of these revenues was allocated to build the Oregon portion of the Pacific Highway (Highway 99E) which was to link the United States with Canada and Mexico. The Pacific Highway ran through downtown Oregon City and crossed the river on the new Willamette River Bridge. The Souvenir program for the dedication of the bridge states that this bridge was the final link for the

[1] Lewis A. McArthur and Lewis L. McArthur, *Oregon Geographic Names* (Portland: Oregon Historical Society Press, 2003), 1022.

highway in Oregon (see attachment 3). By 1940, Highway 99E was rerouted and the bridge was no longer on the route.

THE BRIDGE: DIFFICULT SITE

Since 1917, Clackamas County and the Oregon State Highway Department (OSHD) had been discussing a new bridge at Oregon City. The bridge would be in the same location as an existing suspension bridge which was built in 1888 but could not longer meet the loading requirements imposed on it by the large trucks and buses that would use the new Pacific Highway (Highway 99E).

The site posed special difficulties for the Oregon State Highway Department's (OSHD) chief bridge designer, Conde B. McCullough. He had been aware of the potential difficulties of the Oregon City location and had been studying many alternatives almost from the time he arrived in Salem[2]in 1919 to become the State Bridge Engineer for the OSHD. His description of the location is as follows:

> "The Site takes advantage of the natural topography, being the narrowest channel point within the limits of variation possible with the highway location... The Willamette at the bridge site flows in a well defined and very deep channel bounded by high cliffs of basaltic formation, the maximum stream depth at mean low water being over 100 feet." [3]

Other difficulties were the unusually high volume of vehicular traffic, the corrosive fumes of sulfur dioxide released by nearby pulp mills, and the relatively high level of river traffic. Considering all of the site factors, he tested seven different design solutions before making his final decision.

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[2] Robert W. Hadlow, *Elegant Arches, Soaring Spans: C.B. McCullough. Oregon's Master Bridge Builder* (Corvallis: OSU Press, 2001), 52.

[3] Conde B. McCullough, "Large Steel Arch Bridge Ribs Encased in Gunite", *Engineering News-Record*, Vol.88, No.23 (June 1922): 942.

NPS Form 10-900-a
OMB Approval No. 1024-0018

United States Department of the Interior
National Park Service

National Register of Historic Places Continuation Sheet

THE BRIDGE : DESIGN OPTIONS

Although the first choice for McCullough was always reinforced concrete, he was forced to consider alternatives and in the process created a solution unique in Oregon bridge building. The seven alternatives were:[4]

1. Suspension Span. This was rejected because the loads were thought to be too severe, and the maintenance costs to protect the exposed steel from the sulfur dioxide were prohibitive.
2. Cantilever Span.
3. Simple Truss Span
4. Spandrel Braced Frame Arch. Options 2-4 were rejected because no suitable protective covering was cost effective.
5. Reinforced Concrete Arch. McCullough's preferred solution, but in this case the difficulty and expense of the formwork was prohibitive.
6. Steel Arch Rib with Poured Concrete Encasement. This solution required too lengthy a construction schedule.
7. Steel Arch Rib with Gunite Encasement. This was the preferred design because it was cost effective and timely.

McCullough decided on the half through arch steel box girder design and he planned to use a new procedure (patented in 1911) to encase the steel structure called gunite. Gunite is the controlled application of a mixture of sand, cement, and water which is blown onto wire frames. The application results in a strong thin coating which doesn't slump off the frame as it is applied.

[4] Ibid., 943.

NPS Form 10-900-a
OMB Approval No. 1024-0018

United States Department of the Interior
National Park Service

National Register of Historic Places Continuation Sheet

THE BRIDGE: ASSEMBLING THE ARCHES

Once the design solution was selected another problem arose which was the necessity of building towers in the river itself or on the banks in order to place the steel box girders. McCullough discussed the final construction methodology in an article written for Engineering News-Record,

> "The successful bidder, however, proposed a fifth scheme which was finally approved... This scheme utilized the main cables and towers of the old suspension span (which was to be replaced by the present structure) for the support of the rib sections."[5]

McCullough gives credit to the contractor, A.Guthrie & Co. of Portland and St.Paul, and his sub-contractor Gerrick and Gerrick of Seattle, for the clever and cost effective reuse of the existing structure. The contract was awarded to A. Guthrie & Co. in June, 1921; construction began in July and lasted until December, 1922 when the bridge was dedicated. The total price for the contract was $213,602.50.

THE BRIDGE: AESTHETICS

> "In design, unlike any other bridge yet built: constructed substantially to last for many generations; excellent in material and workmanship and moulded on bold, artistic lines, this bridge fits well the natural beauty of the setting in which it lies."[6]

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[5] Conde B. McCullough, "Old Suspension Bridge Used in Erecting New Arch", *Engineering News-Record*, Vol.89, No.18 (November 1922): 730-733.

[6] Opening of the Willamette River Bridge, Oregon City Enterprise, 1922

The design that inspired this description of the Willamette River Bridge was the product of Conde B. McCullough's engineering philosophy of efficiency, economics, and aesthetics. Robert Hadlow outlines McCullough's philosophy as being grounded in the belief that the most important aspect of bridge engineering was the economics. He differed from many other engineers in the way he interpreted economics. He typically studied different alternatives to a design problem and always factored in long term maintenance and aesthetics as part of the cost of his solution. While other engineers were apt to go for low first cost solutions, McCullough considered bridges as long term public investments. Similarly, his decisions on bridge types were also influenced by the relationship of the road to the bridge. Hadlow quotes McCullough,

> "If the alignment is such that the structure is plainly visible in side elevation from the approaching highway, more attention should naturally be paid to (one) which gives a pleasing side elevation outline than if only the roadway were ordinarily visible."[7]

This is exactly the case in the Willamette River Bridge which is visible for a great distance before the motorist actually makes the turn to enter the bridge. The graceful parabolic arch with the thin canted roadway supported within it is a built example of McCullough's philosophy.

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[7] Robert W. Hadlow, *Elegant Arches, Soaring Spans: C.B. McCullough. Oregon's Master Bridge Builder* (Corvallis: OSU Press, 2001), 48.

NPS Form 10-900-a
OMB Approval No. 1024-0018

United States Department of the Interior
National Park Service

National Register of Historic Places Continuation Sheet

Other design elements which later became McCullough trademarks are present in the bridge. They include:

1. The use (first) of pylons or obelisks to mark the entries and major structural elements of the bridge.
2. The use of elegant yet inexpensive pre-cast concrete handrail and baluster elements.
3. The use of bush hammered zones within large areas of concrete to create more texture and shadow.
4. The careful finish treatment of cast in place concrete surfaces which were typically sanded to give a smooth uniform appearance.
5. The use of cantilevered walkways to minimize the side bridge elevations and not conflict with the line of the bridge structure.

THE BRIDGE: INTEGRITY

The Willamette River Bridge has maintained an unusually high level of integrity due to the nature of bridge design. Bridges are designed as minimal useful objects that serve a single purpose. In the case of the Willamette Bridge, the unusually restrictive setting with its location on the narrow cliffs of Oregon City has left the bridge as it was contextually on dedication day in 1922. The design, workmanship, and materials are all necessarily in place and can only be enhanced by careful repair which is in keeping with ODOTs policy of preserving its bridge heritage, especially the work of Conde B. McCullough.

Finally, the feeling and association of the structure have a high level of integrity because the site overwhelms all else. The steep rock cliffs, the large factories crowded around the Willamette Falls have the same presence and impact they had when the bridge was completed in 1922.

NPS Form 10-900-a
OMB Approval No. 1024-0018

United States Department of the Interior
National Park Service

National Register of Historic Places Continuation Sheet

THE BRIDGE: UNLIKE ANY OTHER

The Willamette River Bridge, with its dynamic arches overlaid with a canted roadway, is a unique confluence of siting, design, and construction. The bridge is one of only four half through arch designs in Oregon[8], the others being:

1. The Rogue River (Caveman) Bridge (reinforced concrete through arch) 1931.
2. The Yaquina Bay (Newport) Bridge (steel through arch)1936
3. The Willamette River (Fremont) Bridge (steel through arch) 1973

The Willamette Bridge was the largest span built by McCullough since coming to the OSHD in 1919, and its 350 foot arch span is only exceeded in his work by the 600 foot Yaquina Bay Bridge central arch which was completed fourteen years after the opening of the Willamette River Bridge. An unusual aspect of the bridge is the five per cent slope its entire 705 foot length. Bridges normally connect roadways at equivalent levels or have symmetrical slopes crowning in the middle of the central span. The slope of the roadway most likely caused additional calculations and some construction difficulties but the result is a unique crossing experience that is not only across but across and up or down.

The engineering of the bridge was innovative and creative. By using a box girder and the new technology of gunite to apply a thin protective coat of cement, McCullough recreated the look of his favored reinforced concrete arch. The bridge also contains aesthetic features, discussed later, that included the unique placement of public restrooms within the bridge structure. The Willamette Bridge combines engineering, siting, and an unusual construction technique to create one of the finest bridges of Oregon's foremost engineer.

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[8]Dwight A. Smith, *et al.*, *Historic Highway Bridges of Oregon* (Portland: Oregon Historical Society Press, 1989), 96.

NPS Form 10-900-a
OMB Approval No. 1024-0018

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National Park Service

National Register of Historic Places Continuation Sheet

CONDE B. McCULLOUGH (1887-1947)

Conde B. McCullough was the Head of the Bridge Division for the Oregon State Highway Department from 1919 to 1935. He is inextricably linked with the history of Oregon transportation and engineering during the flowering of the automobile age. During his sixteen year tenure he participated in the creation and execution of hundreds of projects which were based on his philosophy of efficiency, economy, and aesthetics. He was one of few engineers able to accomplish these Vitruvian goals in his work, most of which still exists today. In 1999, the Engineering News Record listed McCullough as one of the top ten United States bridge designer greats.[9]

Conde Bascom McCullough was born in 1887 in South Dakota. The family moved to Iowa where McCullough grew up and eventually enrolled in the engineering program at Iowa State College (now University) in Ames, Iowa. The head of the Iowa program was Anson Marston who based the curriculum at Iowa on the model of the famous Cornell Engineering program, which incorporated a wide range of academic studies as well as practical experience into its program. Upon graduation from college, in the context of the nascent auto age, the Highway Department offered McCullough the position of State Bridge Engineer which he accepted. His reputation as a bridge designer, his organizational abilities, and the romance of the new auto age attracted many of his former colleagues from Iowa and the Oregon Agricultural College (now Oregon State University) to come and work in the new department. The initial group formed the core of the bridge engineers and remained essentially intact throughout his bridge building career with the OSHD.

[9] Ibid., 1.

Very quickly, bridges began to appear that bore the design trademarks associated with McCullough; the use of well finished reinforced concrete arch bridges, cantilevered walkways, precast railings, and pebbledash inserts were hallmarks of his work. One of his earliest major bridges was the Willamette River Bridge in Oregon City. He was proud of the bridge design and said of the 360 foot half through arch, built without the use of falsework,

> "...an engineering problem ten to one more difficult than any problem presented by any other span in the region.....not surpassed for quality by any bridge work in the United States."[10]

McCullough's second phase was his most famous and included the five large Coast Highway Bridges that were designed between 1933 and 1935. These bridges incorporate many of the design features found on his first phase bridges on a grander scale and are considered the mature works of a master. It is only in these last large bridges that he designed arch spans larger than the Willamette River Bridge. In 1935, McCullough was asked by his old Iowa friend, Thomas H. MacDonald, then head of the U.S. Bureau of Public Roads, to take a leave of absence from the OSHD to design bridges for the United States sponsored Inter-American Highway. He was selected for his ability to design economic bridges and his organizational skills. While in Central America he designed three suspension bridges and developed a keen interest in that bridge type. When he returned from Central America in 1937, he was given an administrative position in the OSHD.

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[10] Robert W. Hadlow, *Elegant Arches, Soaring Spans: C.B. McCullough. Oregon's Master Bridge Builder* (Corvallis: OSU Press, 2001), 54.

NPS Form 10-900-a
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McCullough, always active, found ways to expend his creative energy when his duties became more bureaucratic and not centered on the design and execution of projects. He immersed himself in his latest interests which were engineering law, city planning (Salem), and writing engineering fiction. On May 5, 1946, he suffered a massive stroke and died the next day. He was preparing to return to Central America to design more bridges for the Inter-American Highway. His memory was honored in 1947 when the Coos Bay Bridge was renamed the Conde B. McCullough Bridge, one of only three bridges in the United States to be named after their engineer.[11]

SUMMARY

The Willamette River Bridge between Oregon City and West Linn is an historical resource structure of unusual merit. It remains unaltered in the same location, performing the same function for which it was designed. It is not only a work by Conde B. McCullough, master engineer of Oregon transportation design; it is a masterwork of his initial period with the Oregon State Highway Department. As part of the Oregon Pacific Highway, the structure is inextricably linked with the development of road transportation in Oregon and the Pacific Northwest.

The Willamette River Bridge qualifies for the National Register under Criterion C, as an outstanding and significant structure that embodies the distinct characteristics of bridge construction. It is a premier example of a master's first phase work which possesses high artistic values and has statewide significance. The structure possesses integrity of location, design, setting, materials, workmanship, feeling, and association.

[11]Ibid., 124.

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