

Crooked River High Bridge  
Spanning Crooked River Gorge on the Dalles-California Highway  
Terrebonne vicinity  
Jefferson County  
Oregon

HAER OR-35

DESCRIPTIONS

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PHOTOGRAPHS  
WRITTEN HISTORICAL AND DESCRIPTIVE DATA

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HISTORIC AMERICAN ENGINEERING RECORD

CROOKED RIVER HIGH BRIDGE  
HAER OR-35

Location: Spanning Crooked River on the Dalles-California Highway, three miles north of Terrebonne, between Jefferson and Deschutes Counties, Oregon  
UTM: Opal City, Oregon Quad. 10/439307/4916880

Date of Construction: 1926

Structural Type: Double-hinged steel deck arch

Engineer: Conde B. McCullough, Oregon State Highway Department

Builder: Kuckenbergs & Wittman, Portland, Oregon

Owner: Oregon Department of Transportation

Use: Vehicular and pedestrian bridge

Significance: Crooked River High Bridge was completed in 1926 as part of the Dalles-California Highway (U.S. 97). It was designed by State Bridge Engineer Conde B. McCullough. The bridge is a single-span steel deck arch that is 464' long and 27' wide. The main span is 330' long and consists of a double-hinged braced spandrel deck arch. Hinge pins were provided at both crown and skewbacks. The structure was designed to act under dead load as a three-hinged arch and under live load as an arch with skewback hinges only. There are 134 feet of reinforced concrete approach spans. The railing is constructed of precast concrete arches, with a cast in place cap. The structure was one of the highest bridges in the United States, at 295' from deck to streambed, when it was constructed. A high line cableway was used in the erection of the structure, rather than a traveling derrick or hoist.

Project Information: Documentation of the Crooked River High Bridge is part of the Oregon Historic Bridge Recording Project, conducted during the summer of 1990 under the co-sponsorship of HABS/HAER and the Oregon Department of Transportation. Researched and written by Kenneth J. Guzowski, HAER Historian, 1990. Edited and transmitted by Lola Bennett, HAER Historian, 1992.

Related Documentation: For more information on Conde B. McCullough, see HAER OR-54.

## HISTORY

The Crooked River was named during the fur trading period, and aptly describes this winding tributary. The city of Terrebonne is the nearest community to this bridge. This community was first known as Hillman, a word made by taking parts of the names of two prominent railroad men, James J. Hill and E.H. Harriman, whose lines ran a race to see which could reach central Oregon first. Shortly after the town was founded, the name was changed to Terrebonne, a French expression meaning "good earth."<sup>1</sup>

Prior to the construction of the bridge there existed the Historic Trail Crossing Bridge over the Crooked River Canyon close to Smith Rock. This bridge was razed in 1927 after the completion of the Crooked River High Bridge in 1926. Downstream from the bridge is the steel arch bridge of the Oregon Trunk Railroad, now Burlington Northern Railroad. This bridge was designed by Ralph Modjeski in 1911. A study was made of the proposed bridge site in late winter of 1924. The location study involved the establishment of the "high line" across the gorge. The gorge in this location is approximately 300' wide and 375' deep, with almost vertical basalt rock walls. Excavations revealed that the basalt rock forming the top 70' to 80' of the canyon walls was heavily fissured, necessitating removal of an excess quantity of rock to ensure that none would fall on the completed work. After this was done the remainder of the adjacent rock was concreted in, to prevent further weathering and falling off.<sup>2</sup> The next layer is 110' of dice rock, which is a closely fissured and fine grained basalt considerably more resistant to weathering than the top layer. At the bottom of the gorge was found columnar basalt extending into the rock debris at either side.

At the site of the bridge is Peter Skene Ogden State Park. The pioneer of this name discovered Dry Canyon River in the days of the Hudson Bay Company. Peter Skene Ogden, pioneer trader and explorer, was believed to be the first white man to penetrate the Deschutes country and discover the Crooked River. The park borders both sides of the bridge and was constructed in 1926-27. It was developed from land donated from the railroad and with small parcels purchased from the Federal Government. Construction of this bridge marked the completion of the Dalles-California Highway, one of Oregon's great trunk highways.<sup>3</sup>

Contract No. 840 was awarded July 28, 1925, to Kuckenberg and Wittman, of Portland, Oregon. Work began August 12, 1925 and was completed September 19, 1926. The structural steel erectors were Booth and Pomeroy, of Portland. Resident Engineer was Christ Fauerso. Total cost of the structure was \$140,434.60 with the monies being a match between the State of Oregon and Jefferson and Deschutes Counties.

## DESIGN AND CONSTRUCTION

A location survey of the proposed bridge site was made in February-March 1924. The location involved the establishment of the "high line" across the gorge. At the point of crossing, the main portion of the Crooked River Gorge is approximately 300' wide and approximately 375' deep, with almost vertical walls. State bridge engineer, Conde B. McCullough, chose a single span steel deck arch bridge for the site. It is 464' in length with a width of 27'. There is a 24-foot roadway containing two travel lanes. The main span is 330' long and consists of a double-hinged steel braced spandrel deck arch. The structure has four reinforced concrete deck girder approach spans. From the east there are two 30-foot and one 36-foot reinforced concrete deck girder spans. Followed by the main arch, and concluding with one 38-foot reinforced concrete deck girder span. The structure is unique in its combination of steel arch span and reinforced concrete approach spans and architectural details.

Hinge pins were provided at crown and skewbacks of the main arch. The structure was

designed to act under dead load as a three-hinged arch and under live load as an arch with skew-back hinges only. The steel arch was erected by cantilevering out from temporary anchorages. A cableway was used for placing the steel members. During the cantilever stage of erection, the structure was tied back by means of an eyebar anchorage with an adjustment by means of a pair of geared jacks at each corner. These jacks were spread between a fixed reaction girder, consisting of two heavy I-beams rigidly detailed to a pair of side or guide beams and a floating girder designed to slide between the flanges of the guide beams and support the end of the anchorage chain.<sup>4</sup> The main span has diagonal members between the open spandrel column members.

The structural arch is anchored into concrete abutments secured in the basalt sides of the canyon. The arch supports an 8-inch concrete roadway slab. It was designed for a 21,000-lb. concentration in each traffic lane, followed and preceded by a load of 450 lb. per linear foot. The concrete stress, which was higher than normal for floor slabs, was adopted to reduce the dead-load on the structure. The other unit stresses were figured at a conservative figure because of the general inaccessibility of some of the bridge details for periodic inspection, and to produce maximum rigidity.

Architectural features include an ornamental arched precast concrete bridge railing and rectangular entrance pylons. Massive rectangular pylons, approximately eight feet tall, are found at both approach ends. These display the park and bridge nameplates and consist of horizontal banding with a dentil band beneath the concrete cap. An extension of the railing provides a courtyard at each approach end. Curved railings at the stair cases, leading to the parks, are another feature of these approach spans.

The bridge was dedicated July 15, 1927 with thirty-one members of the Portland Chamber of Commerce in attendance. An Oregonian article explained the significance of this bridge:

The bridge stands as a symbol of all that the building of modern highways has meant to central Oregon. In it the people see the fruition of their greatest hopes, the last link in the modern highway that stretches from north to south across the state, east of the Cascades, bringing tourists to their doors, bringing the farms closer to the cities, uniting the cities themselves in a spirit of neighborliness, where the lack of transportation in the old days meant isolation.<sup>5</sup>

The builders of the bridge realized they were building more than a bridge. All involved were trying to carry into reality a splendid dream. There was something about the enterprise appealing to the imagination, and one and all were rearing a monument to the great achievement that Oregon has made in highway construction. Governor Isaac L. Patterson presided over the ceremonies and Conde B. McCullough attended this dedication.

## REPAIRS AND MAINTENANCE

Crooked River High Bridge has always been subject to high winds and hot sun. Minor repairs were necessary prior to 1937 when transverse cracks were noticed in the deck slab. The expansion joint diaphragms were broken at each end of the steel arch, where they connected with the concrete approach spans, so were replaced in the 1940s. Cracks in the deck became evident in the 1920s and were covered with an epoxy concrete layer. Repairs to the spalling railing was made over the years, and reflectors were placed on the north approach because of numerous accidents. By 1980 some of the welds in the main span were cracking and rivets were popping out. These were repaired and the rivets were replaced with bolts. The steel arch has received regular painting and is in fine condition today.

ENDNOTES

1. Lewis A. McArthur, Oregon Geographic Names, Fifth edition (Portland: Western Imprints, Oregon Historical Society Press, 1982), p.724.
2. Oregon State Highway Commission, Seventh Biennial Report, 1925-1926, p.317.
3. Oregon State Highway Commission, Sixth Biennial Report, 1923-1924, p.234.
4. McCullough, C.B. "Oregon Steel Arch Bridge Erected by Cableway," Engineering News-Record 96, 13 May 1926, pp.760-62.
5. Horace E. Thomas, "Excursion to Bend Opens Visitor's Eyes," The Oregonian, 17 July 1927, pp.1 and 6.

ADDENDUM TO  
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