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HISTORIC AMERICAN ENGINEERING RECORD

GENERALS HIGHWAY, CLOVER CREEK BRIDGE
Sequoia National Park
HAER No. CA-140B

Location: Spanning Clover Creek on the Generals Highway, approximately 22 miles northeast of the Ash Mountain Entrance, Sequoia National Park, Three Rivers vicinity, Tulare County, California.
USGS quadrangle: ~~Giant Forest~~ Three Rivers Vic., California
UTM: 11/343820/4052530

Date of Construction: 1930-1931

Structure type: Reinforced concrete filled spandrel arch bridge

Contractor: W. A. Bechtel Co., San Francisco, California
Subcontractors: C. D. DeVelbiss, San Francisco
Arise-Knapp Co., Oakland, California
A. Pernu
Glen Falls Indemnity, Co.

Designer: Bureau of Public Roads

Architectural Plans: John B. Wosky, National Park Service

Engineer: Eric E. Erhart, Bureau of Public Roads

Owner: Sequoia National Park, National Park Service

Use: Park road bridge

Significance: The Clover Creek Bridge was an important link of the Generals Highway allowing for construction to continue to the General Grant Tree, creating a continuous loop connecting Sequoia National Park with General Grant National Park in 1935. The concrete arch bridge with masonry facade is a good surviving example of National Park Service rustic aesthetic.

Project Information: Documentation of the Clover Creek Bridge is part of the Generals Highway Recording Project, conducted during the summer of 1993 under the co-sponsorship of HABS/HAER and Sequoia National Park.

This is one in a series of reports prepared for the Generals Highway Recording Project, undertaken by the Historic American Engineering Record in summer 1993. For an overview history of the Generals Highway, see HAER No. CA-140, GENERALS HIGHWAY.

Christina Slattery, HAER Historian, 1993.

INTRODUCTION

The 1930-31 construction of the Clover Creek Bridge between the Lodgepole Campground and the current development of Wuksachi on the Generals Highway allowed for the extension of the Generals Highway from Sequoia National Park towards General Grant National Park (now a part of Kings Canyon National Park). The 90' reinforced concrete filled spandrel arch bridge with stone masonry spandrel walls spans the granite canyon of Clover Creek. The bridge was constructed under the same contract as the Lodgepole Bridge [HAER No. CA-140A] and the Silliman Creek culvert under the supervision of the Bureau of Public Roads (BPR). The Clover Creek and Lodgepole bridges were the first drainage structures larger than culverts constructed by the BPR in Sequoia. Included in the 1928 grading contract, the original plans called for a masonry arch culvert to cross Clover Creek, but before construction commenced the culvert was dropped and designs were prepared for a bridge.[1]

Following the completion of the structural plans by the BPR, the bridge design was prepared by John B. Wosky, resident summer landscape architect for Sequoia and Yosemite national parks, in April 1930. BPR engineers generally handled engineering details for such structures while Park Service landscape architects prepared or approved architectural plans.

Stone-faced concrete arch bridges were widely employed in parks in the 1920s and 1930s. The National Park Service constructed stone-faced bridges at Yosemite and Mount Rainier even before the Bureau of Public Roads became involved in park road projects in 1925. Wosky was involved with the design and landscaping of several of the Yosemite bridges. Stone-faced bridges were also prominent features of the urban parkways of the period, and were especially popularized by the Bronx River Parkway in New York City and Westchester County, New York. The Park Service sent Wosky and Ken Carter to Westchester County to study the parkway, which was the first urban parkway opened to motor vehicles. On the Bronx River Parkway, they observed the construction of modern

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[1]Eric E. Erhart, Senior Engineering Inspection Superintendent, Bureau of Public Roads, *Final Construction Report on the Lodgepole, Silliman, and Clover Creek Bridges, Route 1, Generals Highway, Sequoia 1-C2, D1, Sequoia National Park, Tulare County, California, 1930-1931* (San Francisco, CA: Bureau of Public Roads, 1933), 2.

concrete arch bridges with a traditional stone appearance. The design and construction method were adapted for use in the national parks including the Clover Creek and the Lodgepole Bridges in Sequoia. The use of rough masonry, often quarried locally, conformed the appearance of the bridge to blend with its natural surroundings; this was part of a rustic aesthetic advocated by the Park Service landscape architects who wanted park developments to harmonize with their surroundings.

DESCRIPTION

Clover Creek Bridge is a concrete arch structure with a self-supporting masonry spandrel wall 18"-24" thick, supporting a roadway 25' wide.[2] In a letter describing the bridge, BPR engineer George Attwell boasted "engineers compute that this bridge has sufficient strength to carry the world's tallest building loaded with thousands of tons of the heaviest machinery." The bridge foundation, set in the granite canyon, allowed strength and minimal chance of failure in the footings. The roadway was also superelevated; if a car approached the bridge at a set speed, it would follow the road and turn naturally, without the driver turning the wheel. Attwell described this design feature: "The bridge is on a curve, and if the floor were level the cars would naturally lead to the outside. The deck of this bridge is elevated so a car driving 25 to 35 miles per hour will ride as easily as though it were on a level straight road."[3]

CONSTRUCTION

Financing for the bridge came from National Park Service road funds allocated between the 1930 and 1932 seasons. The BPR advertised the contract for the bridges and approaches in trade journals in June 1930. The agency received three bids for the structures ranging from $86,396 to $126,924, and awarded the contract in July to the lowest bidder, the W. A. Bechtel Company, giving the firm 200 days to complete the bridge.[4] The BPR assigned Senior Engineer Inspection Superintendent Eric E. Erhart as resident engineer for the project.

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[2] *Ibid.*, 12.

[3] Walter G. Attwell, Engineer, Bureau of Public Roads, to Mrs. E. C. Snell, 28 September 1935, 3. SEKI Archives.

[4] Erhart, 3.

Bechtel established a construction camp one mile west of Clover Creek early in August 1930 and began excavation on 11 August. Winter weather conditions in November shut down the project for the season with only 31 percent of the work completed. Progress to this point included the pouring of the concrete arch in one pour lasting 48 hours, the excavation of 70 percent of the structure, and the quarrying of 80 percent of the arch ring stones.[5] The contractor was permitted to use granite from the excavation for the arch ring stones and obtained several granite slabs 20"-40" thick that also provided stone for the Marble Fork Bridge. When the supply of granite on site was exhausted a quarry was opened about 300 yards below the Clover Creek Bridge. This quarry supplied stone for about 75 percent of the walls and then a second quarry was opened north of the highway about 1/2 mile west of Clover Creek.[6]

The contractor was inexperienced in the areas of cement rubble masonry and stone work and as a result encountered many problems that forced him to subcontract a majority of the work. For example, rock at the quarry site was not tested prior to the construction of the crushing plant and the site had to be abandoned because the stone was found to be structurally weak. The new quarry site located about 1/4 mile from the crushing plant proved inefficient because additional time and money had to be spent transporting the rock to the plant.

National Park Service landscape architects placed strict controls over the construction methods and post construction appearance of the site. In order to ensure the preservation of the natural canyon, the specifications called for no spalled or chipped areas of the natural rock to show "beyond the neat lines of the completed structure." As a result, the contractor resorted to the use of plugs and feathers along the front faces of abutments and wing walls, using closely spaced holes and light charges of 40 percent dynamite for removing the body of the excavation."[7] The restrictions increased both the amount of work and time needed for project completion but were necessary for the conservation of the landscape.

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[5]Ibid., 4.

[6]Ibid., 9-10.

[7]Ibid., 6.

Construction resumed 11 May 1931, but in order to complete the project Bechtel subcontracted all of the remaining work. C. D. DeVelbiss of San Francisco was engaged as the subcontractor and he in turn subcontracted specialized items of work such as the stone cutting to A. Pernu. Pernu was unable to finance his work and the project was taken over by the Glen Falls Indemnity Company. Learning a lesson from Bechtel's mismanagement of the stone work, the bonding company's replacement contractor decided to use patterns for the cutting of the facing stones. The wooden patterns or templates were made at the bridge brought to the quarry where the stone was cut. The ring stones at Clover Creek were mainly cut by an air surfacing machine and only the curved soffits were hand cut. Erhart's final construction reports indicated that "[as] each stone was set a 1 1/2" by 1" strip was placed in all face joints. This gave the finished walls an appearance and uniformity not existing at Silliman and Lodgepole Bridges."[8]

The bridge was completed 19 October 1931 at a cost of $52,535.78.[9] Although the contractor and subcontractors all suffered losses from the project the work was approved by both BPR engineers and NPS landscape architects.

The historic Clover Creek Bridge was listed in the National Register of Historic Places in 1977.

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[8]Ibid.,10.

[9]Ibid.

BIBLIOGRAPHY

All correspondence, reports, and documents are available in the historic resource files of the Sequoia National Park Archives (abbreviated as SEKI Archives).

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Tweed, William. National Register of Historic Places Nomination for Marble Fork and Clover Creek Bridges, Sequoia National Park. 28 March 1977.

Wosky, John B. Interview by William Tweed. 23 March 1977.

CLOVER CREEK BRIDGE
Sequoia National Park Roads and Bridges
Spanning Clover Creek on Generals Highway, approximately 22 miles NW of Ash Mountain Entrance
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HISTORIC AMERICAN ENGINEERING RECORD

INDEX TO PHOTOGRAPHS

ADDENDUM TO
CLOVER CREEK BRIDGE
Sequoia National Park Roads and Bridges
Spanning Clover Creek on Generals Highway, approximately 22 miles NW of Ash Mountain Entrance
~~Giant Forest Vicinity~~ Three Rivers Vicinity
Tulare County
California

HAER NO. CA-140-B
(Page 2)

CA-140-B-1 to CA-140-B-5 were previously transmitted to the Library of Congress.

INDEX TO COLOR TRANSPARENCIES

All color xeroxes were made from a duplicate color transparency.

Brian C. Grogan, photographer, summer 1993

CA-140-B-6 (CT) CLOVER CREEK BRIDGE, SOUTH ELEVATION, FACING NORTH

HAER
CAL
54-THRIV.V,
2B-

HISTORIC AMERICAN ENGINEERING RECORD

INDEX TO PHOTOGRAPHS

GENERALS HIGHWAY, CLOVER CREEK BRIDGE HAER No. CA-140-B
Generals Highway
Spanning Clover Creek on the Generals Highway, approximately 22 miles NW of Ash Mountain Entrance
~~Sequoia National Park~~ Three Rivers Vicinity
Tulare County
California

Brian C. Grogan, photographer, 1993

CA-140B-1 CLOVER CREEK BRIDGE, SOUTH ELEVATION, FACING NORTH.

CA-140B-2 CLOVER CREEK BRIDGE, SOUTH ELEVATION DETAIL, FACING NORTH NORTHEAST.

CA-140B-3 CLOVER CREEK BRIDGE, NORTH ELEVATION, FACING SOUTH.

CA-140B-4 CLOVER CREEK BRIDGE, SOUTH ELEVATION, FACING NORTHWEST.

CA-140B-5 CLOVER CREEK BRIDGE, NORTH ELEVATION, FACING SOUTHWEST.

CLOVER CREEK

HAER NO. CA-149-B-1

HAER No. CA-149-B-2

HAER NO. CA-149-B-3

HAER NO. CA-149-N-1

HAER NO. CA-140-B-5

CLOVER CREEK