

BOX CANYON TUNNEL

(Muddy Fork Tunnel)

Mount Rainier National Park

Through spur of Stevens Ridge at Box Canyon on Stevens Canyon Highway

Packwood Vicinity

Lewis County

Washington

HAER No. WA-70

HAER
WASH
21-PACK 4
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PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
National Park Service
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I. INTRODUCTION

Location: Through spur of Stevens Ridge 100' west of Muddy Fork Cowlitz River Bridge, Stevens Canyon Highway, Mount Rainier National Park, Packwood vicinity, Lewis County, Washington.
Quad: Mount Rainier East, Wash.
UTM: 10/604200/5179650

Date of Construction: 1950-52

Structure type: Bored tunnel with portals left in "natural" state

Designer: Bureau of Public Roads, U.S. Department of Commerce

Contractor: J. H. and W. J. Conley, Portland, Oregon

Owner: Mount Rainier National Park, National Park Service

Use: Park highway tunnel

Significance: Construction of the Stevens Canyon Road entailed the employment of two tunnels to reduce cliffside scarring in Stevens Canyon. The lower tunnel, through a spur just west of the Box Canyon of the Cowlitz, differs from the other tunnels in the park in that its "portals" are plain bores into the stone, unlike the architectural portals on the upper tunnel and the East Side Road tunnel, which are constructed from dressed stones. The "natural" portals complement other "rustic style" amenities at the Box Canyon site.

Project Information: Documentation of the Box Canyon Tunnel is part of the Mount Rainier National Park Roads and Bridges Recording Project, conducted in summer 1992 by the Historic American Engineering Record.

Richard H. Quin, Historian, 1992

II. HISTORY

This is one in a series of reports prepared for the Mount Rainier National Park Roads and Bridges Recording Project. HAER No. WA-35, MOUNT RAINIER NATIONAL PARK ROADS AND BRIDGES, contains an overview history of the park roads. In addition, HAER No. WA-123, STEVENS CANYON HIGHWAY, contains more specific information on the road on which the tunnel is located.

Stevens Canyon Highway

The Stevens Canyon Highway departs from the Nisqually Road [HAER No. WA-119] above Narada Falls, climbs to a saddle at Reflection Lakes, then drops into the Stevens Creek Canyon. The road then traverses the cliffs on the north side of the canyon down as far as the Box Canyon of the Cowlitz River. From there, the road heads generally southeast around Backbone Ridge to a junction with the East Side Road (Washington Highway 123, HAER No. WA-124). Although the road was not completed until 1957, much of the later work was done in the "Rustic Style," including bridges at Box Canyon [HAER No. WA-60], Nickel Creek [HAER No. WA-59] and Stevens Creek [HAER No. WA-58], a fine stone culvert at Sunbeam Creek, two short tunnels and masonry retaining and parapet walls. The later work includes a series of reinforced concrete viaducts which carry the road around steep sections of cliffs in Stevens Canyon and on the sides of Backbone Ridge, alleviating much scarring.

Box Canyon Tunnel

In order to reduce cliffside scarring in Stevens Canyon and on the side of Backbone Ridge, two tunnels and a series of reinforced concrete viaducts were designed for the central section of the Stevens Canyon Highway. The lower tunnel on the road, located near the Box Canyon of the Cowlitz, was built in 1950-52 in the final phase of the highway construction. Unlike the other two tunnels in the park, the 160' Box Canyon Tunnel is a plain bore through the rock with plain portals, in contrast to the cut stone portals featured on the other structures.

Drawings for the "Muddy Fork Tunnel" (as the structure was formally called) were prepared at the San Francisco regional office of the Public Roads Administration (PRA, the Depression-era successor to the Bureau of Public Roads) in the fall of 1940.¹ The tunnel project was awarded to Portland, Oregon contractor Sam B. Orino as part of the Stevens Canyon Road Project 4D Unit 4 Grading and Tunnel contract, one of three contracts Orino held for construction on the Stevens Canyon Highway. Orino's company had built the tunnel and Deer Creek Bridge on the East Side Road, and had recently constructed the Stevens Creek Bridge and completed several grading contracts on the Stevens Canyon Highway. However, the outbreak of World War II forced a halt to operations. On 3 September 1942, Orino was formally ordered by the PRA to suspend work on all of his contracts on account of wartime shortages of manpower and materials.²

The Public Roads Administration attempted to resume work on the Stevens Canyon Highway in 1947 by advertising the construction of the Box Canyon and Nickel Creek bridges. However, no bids were received, and the PRA was forced to suspend its plans.³

Contracts were advertised again in the fall of 1949, and this time an award was made for the remaining work in the Box Canyon-Nickel Creek area. The bids were opened at the District 8 Office of the reconstituted Bureau of Public Roads in Portland, Oregon on 29 November 1949. The contract for construction

of the Box Canyon Tunnel was awarded to J. H. and W. J. Conley of Portland, Oregon, doing business sometimes as Conley & Company.⁴

No final construction reports for the project were located in the recording project, but park superintendents' reports and reports for other road projects provide some information on dates of construction and operations. Work started in May 1950 when the Conleys began clearing snow from the road from Paradise eastward so that their crews might reach the tunnel site near Box Canyon.⁵ This coincided with the start of operations by contractors Hawkins & Armstrong on the adjacent Muddy Fork Cowlitz River Bridge.

PRA/BPR engineers estimated the following quantities of excavation or materials would be required for the tunnel's construction:

Tunnel excavation, Type "A"	77 lin. ft.
Tunnel excavation, Type "B"	50 lin. ft.
Tunnel excavation, Type "C"	35 lin. ft.
Class "A" concrete	30 cu. ft.
Untreated timber	30 M.B.M.
Cordwood packing	25 cords
Reinforcing steel	1,000 lbs. ⁶

The above quantities were only estimates, and revisions were made to suit field conditions. For instance, the length of the tunnel was indicated as an approximation, and the exact length was to be specified by the field engineer.⁷ The drawings indicate that a "pioneer" bore would be driven into sections first, then the cut would be expanded to the entire bore.

Drilling began in early summer, and by the end of September, over 100' of the 160' tunnel had been excavated. The bore was complete by the end of November 1950. Winter weather conditions forced a shutdown at this point, and the work did not resume until the following May.⁸ The remaining operations consisted of clearing and trimming the bore and preparing the roadway subgrade.

Construction drawings were prepared for a reinforced concrete lining for the tunnel. However, due to the excellent nature of the rock encountered, the lining proved unnecessary and the tunnel is a plain bore through the mountain spur. Specifications on the construction drawings offer details on a planned lining. A temporary timber lining was to be constructed from select structural grade 12" x 12" timbers, with the sets spaced at distances ranging from 2' 6" to 5' center-to-center as directed by the project engineer. Wooden spreaders, measuring 3" x 12," were to be placed between the main timbers, but could be omitted by order of the engineer. All joints were to be blocked or held in position by sawed timber blocks, struts or wedges as required. Cordwood packing was to be placed between the lagging and the rock where directed by the engineer. All of the timber reinforcing was to rest on poured Class "A" concrete footings. The permanent lining was to be a reinforced concrete arch ring, approximately 2' 6" in thickness. The lining would have required 35 cubic yards of concrete and 4,600 pounds of reinforcing steel.⁹

Conley and Company finished operations at the tunnel at Box Canyon in September 1952.¹⁰ This tunnel was unique among the park bridges in that it was left unlined (mainly due to the excellent nature of rock) and was not provided with a cut stone portal; such treatments resulted in a more rustic structure.

The tunnel was surfaced under a subsequent contract. The Stevens Canyon Highway was opened to public travel 4 September 1957. A ribbon-cutting ceremony was held at the Box Canyon development. Construction began the

following year for a picnic area and parking lot just west of the tunnel; these facilities were completed in 1961.¹¹ The Box Canyon Tunnel was resurfaced in 1966 by the Cascade Asphalt Paving Company of Tacoma, Washington, as part of a general resurfacing contract for nearly 12 miles of the Stevens Canyon Highway and the East Side Road.¹²

Description

One hundred feet west of the Muddy Fork Cowlitz River Bridge [HAER No. WA-60], the Box Canyon or Muddy Fork Tunnel carries the Stevens Canyon Highway through a shoulder of Stevens Ridge into Stevens Canyon proper. The tunnel is a 160' bored tunnel with only the rock cut for the portals; that is, no cut stone or arched portals are provided as on the other two tunnels in the park. The tunnel is 34' wide at the spring line and is bored on an 18' radius, standing 24' 6" in height from the center line of the roadway to the tunnel crown.¹³ The planned reinforced concrete lining was never installed.

The roadway is superelevated .07 per foot (a 5° grade) on the same line as the adjacent Muddy Fork Bridge. During construction, a 1' compacted granular cushion was applied on the roadway lanes and sidewalks; this was removed when the 7" bituminous asphalt surfacing was applied under a subsequent contract.

The tunnel is in overall good condition. However, park staff indicate that rocks occasionally break loose from the unlined tunnel and fall to the roadway below. This occurs fairly frequently near the tunnel portals, where freezing and thawing acts on the fissures in the rock. When the Stevens Canyon Highway is cleared of snow and reopened each spring, debris often has to be removed from the roadway at the portal ends.¹⁴

III. ENDNOTES

1. Federal Works Agency, Public Roads Administration, "Reinforced Concrete Arch Ring, Muddy Fork Tunnel, Stevens Canyon Hwy. Proj. 4-D, Unit 4," construction drawing 7-229 (Portland, OR: Bureau of Public Roads, Division No. 8, September 1940); U.S. Department of Commerce, Bureau of Public Roads, "Portal Section, Muddy Fork Tunnel, Stevens Canyon Hwy. Proj. 4-D, Unit 4, Sta. 428+20 to 429+82," construction drawing 7-227 (Portland, OR: Bureau of Public Roads, Division No. 8, November 1940); "Tunnel Details, Muddy Fork Tunnel, Stevens Canyon Hwy. Proj. 4-D, Unit 4, Sta. 428+20 to 429+82," construction drawing 7-226 (Portland, OR: Bureau of Public Roads, Division No. 8, September 1940). [Note that in this period, the Bureau of Public Roads had been reorganized as the Public Roads Administration. After the war, the agency was reconstituted as the Bureau of Public Roads and transferred to the U.S. Department of Commerce. Mention of the BPR and the Commerce Department in the title blocks indicates that the drawings were re-issued for the bridge's construction.]
2. John C. Preston, Superintendent, Mount Rainier National Park, Superintendent's Monthly Report, November 1942, 3. MORA Archives, Box H2621, Superintendents' Monthly Reports 1940-1946 file.222
3. Idem, Superintendent's Annual Report, 1947, 7. MORA Archives, Box H2621, Superintendents' Annual Reports 1941-1953 file.
4. W. H. Lynch, Division Engineer, Bureau of Public Roads, Portland, OR, to Preston, 10 November 1949. MORA Archives, Roads and Trails Box 1.
5. Preston, Superintendent's Monthly Report, May 1950, 3. MORA Archives, Box H2621, Superintendents' Monthly Reports 1947-1952 file.
6. Estimated quantities table on BPR construction drawing 7-226.
7. *Ibid.*.
8. Preston, Superintendent, Mount Rainier National Park, Superintendent's Monthly Report, May 1950, 3; Superintendent's Monthly Report, September 1950, 3; Harthon L. Bill, Acting Superintendent, Mount Rainier National Park, Superintendent's Monthly Report, November 1950. MORA Archives, Box H2621, Superintendents' Monthly Reports 1947-1952 file; N. L. James, Resident Engineer, U.S. Department of Commerce, Bureau of Public Roads, "Final Construction Report, Stevens Canyon Highway, Mt. Rainier National Park Project 4-D and 4-E2, Units 1 and 3, Bridges and Viaducts, Mt. Rainier National Park, Lewis County, Washington" (Portland, OR: Bureau of Public Roads, 1954), 2.
9. See BPR/PRA construction drawings 7-226 and 7-229, *op cit.*
10. Curtis K. Skinner, Acting Superintendent, Mount Rainier National Park, Superintendent's Monthly Report, August 1952, 4; Macy, Superintendent's Monthly Report, September 1952, 3. MORA Archives, Box H2621, Superintendents' Monthly Reports 1947-1952 file.

11. Macy, Superintendent's Annual Report, 1958, 4; Ruben O. Hart, Acting Superintendent, Mount Rainier National Park, Superintendent's Annual Report, 1962, 2. MORA Archives, Box H2621, Superintendents' Annual Reports, 1954-1966, 1962-1964 files; Earl B. Wilson, Park Engineer, Mount Rainier National Park, "Completion Report R-159, Box Canyon Picnic Area Roads," typed MSS, 20 November 1959, 1. MORA Archives, Roads and Trails Box 1.

12. J. P. McGarry, Resident Engineer, Bureau of Public Roads, "Final Construction Report, Stevens Canyon Road and East Side Road, Mt. Rainier National Park Project C-14, D10, E14 & 5-A6, Bituminous Surfacing and Roadside Improvement, Mt. Rainier National Park, Lewis County, Washington" (Portland, OR: Bureau of Public Roads, 1969), 1.

13. See BPR/PRA construction drawing 7-226.

14. Interview with Randy Brooks, District Ranger, and Clark Crane, Chief of Maintenance, Mount Rainier National Park, October 1992.

IV. BIBLIOGRAPHY

- Bill, Harthon L., Acting Superintendent, Mount Rainier National Park. Superintendent's Monthly Report, November 1950. MORA Archives, Box H2621, Superintendents' Monthly Reports 1947-1952 file.
- Federal Works Agency, Public Roads Administration. "Reinforced Concrete Arch Ring, Muddy Fork Tunnel, Stevens Canyon Hwy. Proj. 4-D, Unit 4." Construction drawing 7-229. Portland, OR: Bureau of Public Roads, Division No. 8, September 1940.
- Hart, Ruben O., Acting Superintendent, Mount Rainier National Park. Superintendent's Annual Report, 1962. MORA Archives, Box H2621, Superintendents' Annual Reports, 1962-1964 files.
- Hill, Sanford, Assistant Regional Director, National Park Service Region Four, San Francisco, CA, to W. H. Lynch, Division Engineer, Bureau of Public Roads, Division 8, Portland, OR, 30 October 1952.
- James, N. L., Resident Engineer, U.S. Department of Commerce, Bureau of Public Roads. "Final Construction Report, Stevens Canyon Highway, Mt. Rainier National Park Project 4-D and 4-E2, Units 1 and 3, Bridges and Viaducts, Mt. Rainier National Park, Lewis County, Washington." Portland, OR: Bureau of Public Roads, 1954.
- Lynch, W. H., Division Engineer, Bureau of Public Roads, Portland, OR, to John C. Preston, Superintendent, Mount Rainier National Park, 10 November 1949. MORA Archives, Roads and Trails Box 1.
- McGarry, J. P., Resident Engineer, Bureau of Public Roads. "Final Construction Report, Stevens Canyon Road and East Side Road, Mt. Rainier National Park Project C-14, D10, E14 & 5-A6, Bituminous Surfacing and Roadside Improvement, Mt. Rainier National Park, Lewis County, Washington." Portland, OR: Bureau of Public Roads, 1969.
- Macy, Preston P., Superintendent, Mount Rainier National Park. Superintendent's Monthly Report, August 1951. MORA Archives, Box H2621, Superintendents' Monthly Reports 1947-1952 file.
- Superintendent's Monthly Report, September 1952. MORA Archives, Box H2621, Superintendents' Monthly Reports 1947-1952 file.
- Preston, John C., Superintendent, Mount Rainier National Park. Superintendent's Monthly Report, May 1950. MORA Archives, Box H2621, Superintendents' Monthly Reports 1947-1952 file.
- Superintendent's Monthly Report, September 1950. MORA Archives, Box H2621, Superintendents' Monthly Reports 1947-1952 file.
- Skinner, Curtis K., Acting Superintendent, Mount Rainier National Park, Superintendent's Monthly Report, August 1952. MORA Archives, Box H2621, Superintendents' Monthly Reports 1947-1952 file.
- U.S. Department of Commerce, Bureau of Public Roads. "Portal Section, Muddy Fork Tunnel, Stevens Canyon Hwy. Proj. 4-D, Unit 4, Sta. 428+20 to 429+82." Construction drawing 7-227. Portland, OR: Bureau of Public Roads, Division No. 8, November 1940.

--"Tunnel Details, Muddy Fork Tunnel, Stevens Canyon Hwy. Proj. 4-D, Unit 4, Sta. 428+20 to 429+82." Construction drawing 7-226. Portland, OR: Bureau of Public Roads, Division No. 8, September 1940.

Wilson, Earl B., Park Engineer, Mount Rainier National Park. "Completion Report R-159, Box Canyon Picnic Area Roads." Typed MSS, 20 November 1959. MORA Archives, Roads and Trails Box 1.