

HEMLOCK BRIDGE  
Acadia National Park Roads & Bridges  
Spanning Maple Spring Brook on West Sargent Mountain Road  
Northeast Harbor Vicinity  
Hancock County  
Maine

HAER NO. ME-34

HAER  
ME  
S-NORHAY  
3-

WRITTEN HISTORICAL AND DESCRIPTIVE DATA  
PHOTOGRAPHS  
XEROGRAPHIC COPIES OF COLOR TRANSPARENCIES

HISTORIC AMERICAN ENGINEERING RECORD  
National Park Service  
Department of the Interior  
P.O. Box 37127  
Washington, D.C. 20013-7127

HISTORIC AMERICAN ENGINEERING RECORD

HEMLOCK BRIDGE

HAER No. ME-34

HAER  
ME  
S-NORH.A.V.  
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LOCATION: Spanning Maple Spring Brook on Jordan-Sargent Mountain carriage road (Around-the-Mountain Loop), 1½ miles NNE of Brown Mountain Gate, Northeast Harbor vicinity, Mount Desert Island, Hancock County, Maine

Quad: Seal Harbor, ME  
UTM: 19/557300/4908700

DATE OF CONSTRUCTION: 1924

ARCHITECT: William Welles Bosworth, New York

ENGINEER: Paul D. Simpson, for John D. Rockefeller, Jr.

CONTRACTOR: B. W. Candage & Son, Seal Harbor, ME

STRUCTURE: Stone-faced reinforced concrete filled spandrel arch bridge

FHWA NO.: 1700-014S

OWNER: Acadia National Park, National Park Service

SIGNIFICANCE: One of only two Gothic-arched bridges on the Rockefeller carriage road system, Hemlock Bridge is one of eight major stone bridges on the "Around-the-Mountain" carriage road loop. The pointed arch design was chosen for its harmony with the pointed hemlock trees which surround the site. Like several of the other spans, Hemlock Bridge serves as a viewing platform, offering a splendid vista of Somes Sound and the Western Mountain mass.

PROJECT INFORMATION: Documentation of Hemlock Bridge is part of the Acadia National Park Roads and Bridges Recording Project, conducted in 1994-95 by the Historic American Engineering Record of the National Park Service. This is one in a series of project

reports. HAER No. ME-13, ROCKEFELLER CARRIAGE  
ROADS, contains more specific information on the  
park carriage road system.

Richard H. Quin, HAER Historian, 1994

This report is part of the Acadia National Park Roads and Bridges  
Recording Project. HAER No. ME-13, ROCKEFELLER CARRIAGE ROADS,  
contains more specific information on the carriage road system.

### HISTORY

The West Sargent Mountain Road was planned by John D. Rockefeller, Jr. as part of a grand loop carriage road system encircling the central mountains of Acadia (then Lafayette) National Park. Construction began in 1921. This section required two major bridges in the upper Hadlock Brook drainage. Due to the location of the road, the two bridges, Waterfall and Hemlock, are located less than 100 yards apart. A lower road routing would have required only one crossing (Maple Spring Brook joins Hadlock Brook just below the bridge), but the two bridge sites were chosen for scenic effect. Waterfall Bridge [HAER No. ME-35] is located along a picturesque cascade which lends it its name, and Hemlock Bridge affords a view toward Northeast Harbor to the south.

Hemlock Bridge is somewhat of an anomaly for the system. Unlike the earlier bridges, which included an unusual arched bridge faced in cobbles [Cobblestone Bridge, HAER No. ME-31] and a series of small arched spans copied from a prototype in New York's Central Park, Hemlock Bridge is a massive granite structure featuring a central Gothic arch. It was the first of the large granite bridges to be constructed and one of only two to employ a pointed arch. This design was evidently adopted as appropriate for the surrounding dense hemlock forest which lends the bridge its name.

Both bridges were designed by New York architect William Welles Bosworth (1869-1966), who had designed Rockefeller's New York townhouse and the gardens at Kykuit, the family's estate in Pocantico Hills. Rockefeller's carriage road engineer, Paul Simpson, did the topographic work for the site and oversaw their construction, which was carried out by Sam Candage, a Seal Harbor contractor.

Specifications for the two bridges were issued in May 1923. They called for the arch and superstructure to be built on solid rock, leveled by blasting if necessary. Wooden forms of spruce or hemlock would be used to frame up the arch and for foundations, beams and walls. The concrete masonry would be strengthened with steel reinforcing bars.<sup>1</sup>

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<sup>1</sup>"Specification for the Bridges on Jordan-Sargent Mountain Road at Waterfall Bridge Site and at Hemlock Bridge Site at Seal Harbor, Maine for J. D. Rockefeller, Jr.," 15 May 1923. Rockefeller Archives Center, Office of the Messrs. Rockefeller,

The stone facing was to be split quarry faced stone of irregular sizes, cut to fit the shapes shown on the drawings. All stones were to be cut so that the joints would be of similar size, allowing for an arch of full strength. The concrete arch ring foundations were to be anchored to the concrete substructure and abutments. At least every third stone would be anchored to the concrete with 3/4" iron cramps; the stones forming the bottom of the arch barrel were to be similarly attached. A five-ply felt waterproofing membrane impregnated with pitch was to cover the concrete slab forming the floor of the bridge's roadway. The space around the arch would be filled with crushed stone to match the planned road surfacing.<sup>2</sup>

Upon receipt of the preliminary drawings and specifications, Paul Simpson, went over the Hemlock Bridge site with Sam Candage, who was asked to submit a bid for the project. Candage telegraphed a bid of \$42,130 to Rockefeller on 18 June, offering to do the work on a cost and percentage basis and expressing the belief he could do the work for less than the bid price.<sup>3</sup> This would not prove to be the case.

In early June 1923, Simpson reported he was encountering difficulties in locating suitable face stone near the bridge site. Stone could be secured from the Brown Mountain quarry, but Candage claimed this would involve extensive transport. Some could be taken from a site half a mile south of the nearby Waterfall Bridge, but it was not available that season. Simpson asked Rockefeller if he would consider building the bridge of concrete masonry, as this would make for increased economies of cost and time. However, he acceded that a stone-faced bridge would present a better appearance. Simpson had found Bosworth's plans for the bridge attractive, but suggested they should be constructed to give an "appearance of simplicity and rugged strength." To this end, he suggested eliminating the small blind arches on the sides of the bridge. Simpson also favored having the arch ring stones or voussoirs and the coping stones on the parapet project outward from the face of the bridge to break up

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Record Group 2, Homes (Seal Harbor), Box 121 Folder 1217.

<sup>2</sup>Ibid.

<sup>3</sup>Rockefeller to Sam Candage, 3 December 1924. Rockefeller Archives Center, Office of the Messrs. Rockefeller, Record Group 2, Homes (Seal Harbor), Box 122 Folder 1227.

the flatness of the wall surfaces. He also recommended using solid spandrels filled with rock and broken stone to support the roadway. The arches, he added, should be designed to support a 20-ton load, the weight of the heaviest road roller expected to be used on the system.<sup>4</sup>

Rockefeller dismissed the thought of building the bridge of concrete masonry, stating he felt it would look "artificial" in the setting. He instructed Bosworth to proceed with the stone-faced design. He forwarded Simpson's recommendations, several of which were adopted. Revised plans for the structure were forwarded by Bosworth's office a week later. They adopted Simpson's suggestion to have the coping stones and voussoirs project beyond the plane of the bridge, and for the use of solid spandrels filled with rock and broken stone. The firm suggested the wall should be built on a batter, beginning 4' from the bottom and narrowing toward the top of the wall.<sup>5</sup>

In December, Simpson wrote Rockefeller to suggest omitting the two small blind arches from the upstream side of the bridge, pointing out that it would be necessary to do some excavation and remove vegetation just to make them visible. Rockefeller wrote back, agreeing to the suggested change.<sup>6</sup> The bridge as built features the small arches on the downstream elevation only.

Construction photographs in the Rockefeller Archives Center provide some information on the bridge work. Stone was moved to the construction site on a wooden tramway built adjacent to the bridge, and lifted into place with a gate-leg derrick. Heavy

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<sup>4</sup>John D. Rockefeller, Jr. New York City, to Paul D. Simpson, Seal Harbor, ME, 12 June 1923; Simpson to Rockefeller, 9 June 1923. Rockefeller Archives Center, Office of the Messrs. Rockefeller, Record Group 2, Homes (Seal Harbor), Box 121 Folder 1217, Box 122 Folder 1227.

<sup>5</sup>W. R. Pearsall for Welles Bosworth, New York City, to Simpson, 15 June 1923. Rockefeller Archives Center, Office of the Messrs. Rockefeller, Record Group 2, Homes (Seal Harbor), Box 122 Folder 1227.

<sup>6</sup>Simpson to Rockefeller, 24 December 1923; Rockefeller to Simpson, 31 December 1923. Rockefeller Archives Center, Office of the Messrs. Rockefeller, Record Group 2, Homes (Seal Harbor), Box 122 Folder 1227.

wooden timbers were used for the falsework. The specifications and construction photographs show that the exterior walls of the bridge were self-supporting masonry walls. They were constructed on a considerable batter to help resist the outward thrust of the roadway fill.

The work was well advanced by early summer 1924. On 23 June 1924, Paul Simpson wrote Rockefeller's personal secretary, Charles O. Heydt, concerning Candage's work and expressing surprise that the cost of the structure was already exceeding Candage's estimate. Simpson blamed a number of factors on the excessive cost. The most important, he figured, was Candage's insistence on continuing the work over the winter season. Quarrying and transportation was more difficult and expensive, and the water and materials for the concrete had to be heated by steam, which meant that special equipment had to be employed. Labor was less efficient in winter as well. Rockefeller understood Candage's desire to complete the work early and maintain his work force intact, but he felt the work should have been suspended for the season. Other additional costs came from a requirement to provide deeper foundations, from adoption of a higher standard of stonework, and from the opening of the quarry which also supplied stone for the Waterfall Bridge (part of which cost should be ascribed to the Waterfall account). The latter factors were acceptable to Simpson, but he was still appalled at Candage's submission of claims for higher costs than had been expected. Heydt was conciliatory in his reply, noting the cost overruns had not been terribly excessive, though he agreed the work should not have been prosecuted over the winter.<sup>7</sup>

The costs continued to mount. In late August, Heydt reported to Rockefeller that as of 4 August, Candage's bills had amounted to \$50,043.11, and the work was still underway. He felt Candage was an honest contractor, but poorly organized. Men were frequently standing around on the job because arrangements to assign them to tasks were not effective.<sup>8</sup>

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<sup>7</sup>Simpson to Charles O. Heydt, 23 June 1924; Heydt to Simpson, 26 June 1924. Rockefeller Archives Center, Office of the Messrs. Rockefeller, Record Group 2, Homes (Seal Harbor), Box 122 Folder 1227.

<sup>8</sup>Heydt to Rockefeller, 23 August 1924. Rockefeller Archives Center, Office of the Messrs. Rockefeller, Record Group 2, Homes (Seal Harbor), Box 121 Folder 1217.

Rockefeller wrote Candage himself on 24 October, reminding him of his "high regard and warm friendship," but expressing disappointment at the cost overruns. While he would be willing to foot the additional costs, he told Candage he did not think he should pay a commission on the costs in excess of the original estimate. He enclosed a check for the full commission on the overage, but hoped Candage would see fit to make an adjustment. Candage returned the check a week later, stating that their friendship "means a great deal more to me than I could buy with money," and expressing the belief that both would feel better about each other under the arrangement. He was pleased to report that the bridge was complete and the site had been cleaned up.<sup>9</sup>

Evidently struck by Candage's generous response, Rockefeller wrote back on Christmas Eve, stating that he did not want Candage to suffer from the arrangement, and offering to split the commission on the overruns. Candage refused, wanting to stick to the original agreement, and the matter of the cost was settled. The total cost of the structure was \$59,067.<sup>10</sup>

In 1993, Hemlock Bridge was subjected to extensive testing and analysis as part of a bridge rehabilitation study undertaken by Vanasse Hangen Brustlin, Inc., a Boston engineering firm under contract to the North Atlantic Regional Office of the National Park Service. The study identified several problems with the structure, including cracking of stones on the intrados or underside of the arch, deposition of calcium carbonate on the intrados and spandrel and wing walls (an indicator of poor drainage), mortar joint deterioration, and vegetation growth on the roadway margins. Improper drainage appeared to be the cause of most problems. Drainage weep holes designed for the structure were never provided, and no other outlets for water were installed. The report recommended waterproofing the entire roadway to drain water away from the structure, repointing all

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<sup>9</sup>Rockefeller to Candage, 21 October 1924; Candage to Rockefeller, 2 November 1924. Rockefeller Archives Center, Office of the Messrs. Rockefeller, Record Group 2, Homes (Seal Harbor), Box 122 Folder 1227.

<sup>10</sup>Rockefeller to Candage, 3 December 1924, 10 December 1924. Rockefeller Archives Center, Office of the Messrs. Rockefeller, Record Group 2, Homes (Seal Harbor), Box 122 Folder 1227; "Bridges Built by B. W. Candage," *op cit.*



mortar joints, and removing the calcium carbonate efflorescence.<sup>11</sup>

#### DESCRIPTION

The bridge is a hybrid stone and concrete masonry structure, constructed with self-supporting spandrel and side walls and a concrete arch barrel faced in stone. The bridge measures 200' in length and spans Maple Spring Brook on a single pointed arch with a 37' clear span standing 27'6" above the stream. The 16' roadway is constructed on a tangent, though the heavy sweep of the structure's wing walls gives the appearance of a curve. The curve is asymmetrical, as the western wings extend roughly 30' longer than the east. The roadway is flanked on either side by solid masonry parapet walls which terminate in rounded stone curtails. The date of construction, 1924, is carved at the center of the southwest parapet wall.

The distinguishing feature of the bridge is its pointed Gothic arch, which was apparently selected to complement the pointed effect of the Eastern hemlock trees that grow in abundance around the site. The arch is defined by cut stone arch ring stones or voussoirs which radiate from a central keystone. Smaller blind arches are located to either side of the main arch on the downstream side. The voussoirs and the coping stones atop the parapet project outward from the face of the bridge walls, providing a measure of visual relief from the heavy masonry mass. The internal structure of the bridge is a reinforced concrete arch. Above a pitch-impregnated waterproofing membrane, the space between the walls is filled with broken rock and stone, on top of which is the broken stone roadway surface.

The Maple Spring Trail, one of numerous approach trails to the summit of Sargent Mountain, passes beneath the bridge. Stone steps from the trail lead to the bridge, allowing access to the path from the carriage road. Because the trail passes beneath the bridge, the bottom of the barrel arch is faced with stone so the internal concrete construction will not be visible to trail users. The bridge is located in a heavily wooded zone dominated by the hemlock trees which lend the structure its name. Waterfall Bridge is located less than 100 yards to the northwest, and is clearly visible from the bridge.

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<sup>11</sup>Vanasse Hangen Brustlin, Inc. and McGinley Hart & Associates, *Historic Bridge Reconnaissance Survey, Carriage Road System, Acadia National Park* (Boston, MA: National Park Service, North Atlantic Regional Office, September 1993), 43-46.

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--to Candage, 3 December 1924. Rockefeller Archives Center, Office of the Messrs. Rockefeller, Record Group 2, Homes (Seal Harbor), Box 122 Folder 1227.

--to Candage, 3 December 1924. Rockefeller Archives Center, Office of the Messrs. Rockefeller, Record Group 2, Homes (Seal Harbor), Box 122 Folder 1227.

--to Candage, 10 December 1924. Rockefeller Archives Center, Office of the Messrs. Rockefeller, Record Group 2, Homes (Seal Harbor), Box 122 Folder 1227.

# DRAFT

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--to Paul D. Simpson, Seal Harbor, ME, 12 June 1923.  
Rockefeller Archives Center, Office of the Messrs.  
Rockefeller, Record Group 2, Homes (Seal Harbor), Box 121  
Folder 1217.

--Rockefeller to Simpson, 31 December 1923. Rockefeller  
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*Acadia National Park.* Boston, MA: National Park Service,  
North Atlantic Regional Office, September 1993.

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Jet Lowe, Photographer, May 1995

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- ME-34-3 DETAIL OF WEST PORTAL OF HEMLOCK BRIDGE.
- ME-34-4 HEMLOCK BRIDGE IN ELEVATION, NE BY 30 DEGREES.
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Jet Lowe, Photographer, May 1995

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