

ASH FORK STEEL DAM
(Ashfork-Bainbridge Steel Dam)
Johnson Canyon
Ash Fork vicinity
Yavapai County
Arizona

HAER AZ-90
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WRITTEN HISTORICAL AND DESCRIPTIVE DATA

FIELD RECORDS

HISTORIC AMERICAN ENGINEERING RECORD

National Park Service
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HAER No. AZ-90

- Location:** Johnson Canyon, Ash Fork vicinity, Yavapai County, Arizona
- Date of Construction:** 1898
- Engineers:** F.H. Bainbridge, Designing Engineer
James Dunn, Chief Engineer, Santa Fe Pacific Railway
A.F. Robinson, Bridge Engineer, Santa Fe Pacific Railway
W.D. Nicholson, Resident Engineer for Construction, Santa Fe Pacific Railway
- Builders:** Wisconsin Bridge and Iron Company; Santa Fe Pacific Railway
- Original Owner, Use:** Santa Fe Pacific Railway, railroad water supply
- Present Owner, Use:** Kaibab National Forest (as of 2012), water storage
- Significance:** The Ash Fork Steel Dam was the first large, all-steel fixed dam and one of only three constructed in the United States.
- Description:** The Ash Fork Steel Dam is located in Johnson Canyon, which remains dry most of the year. The maximum height of the dam is 46'. It is 300' long on top, including the masonry abutments, while the steel section is 184' long. The dam's maximum height is 46'. Structurally it consists of a series of twenty-four triangular steel bents measuring between 12' and 42' tall and resting on concrete foundations. The steel face plates are riveted to the bents on the inclined, or upstream, face on a slope of 45 degrees. The steel plates are $\frac{3}{8}$ " thick, 8' long, and nearly 9' wide. There is no specific spillway, because the dam was designed to permit the flow of up to 6' of water over its crest. The foundation of the dam is concrete against stone with the steel of the dam being sunk into the concrete at the face.
- History:** The Santa Fe Pacific Railway (a subsidiary of the Atchison, Topeka & Santa Fe Railway) station at Ash Fork, Arizona, had been plagued by a lack of water for about twenty years. The inadequate ground water supply in the Ash Fork area made it necessary to carry 90,000 gallons of water by tank cars a distance of 27 to 45 miles each day for steam locomotive boiler

supply. Since Ash Fork and its environs are located in an area of former volcanic activity and faults, attempts at drilling artesian wells had been unsuccessful. In the late 1890s, Mr. F.H. Bainbridge, a civil engineer in Chicago, proposed the construction of a steel dam in Johnson's Canyon, 4 miles east of Ash Fork, to provide a supply of water to the railway at Ash Fork. Together with James Dunn, the Chief Engineer of the Santa Fe system, Bainbridge designed a steel dam to be erected on the site. The dam would form a storage reservoir with a capacity of 36 million gallons.

Actual construction began in 1897, with the work under the supervision of Mr. R.B. Burns, the Chief Engineer of the Santa Fe Pacific Railway, and Mr. W.D. Nicholson, Assistant Engineer, who was in direct charge of construction. The Wisconsin Bridge and Iron Company of Milwaukee held the contract for the construction and erection of the iron work, while the excavation, concrete and masonry work, anchorages, and outlet were all executed by the railway company.

The framework of steel bents was first erected. The various members were blocked up into position in such a way as to allow free access for the embedding of their ends in concrete and for the drilling of the holes for the anchor bolts. When the framework was erected and the anchor bolts set, the face plates were riveted on, except for the lowest course of plates in the five highest panels of the dam, which were left open to provide a waterway until the rest of the structure was caulked and painted, and the dam in proper condition to withstand water pressure. The remaining plates were then put in place, riveted up, and caulked as rapidly as possible.

All of the metalwork, except the faceplates, was given one coat of raw linseed oil at the shops, this coating being omitted on all parts to be embedded in concrete. The face plates were not oiled or painted, but after erection, they were cleaned of all rust, dirt and grease, and then covered with a coat of graphite paint.

The outlet pipe of 6" pipe was bedded in a trench excavated in the rock under the dam, the pipe terminating in a drain within the reservoir. From the downstream end of this pipe, a 4"-diameter pipeline extended to the town of Ash Fork.

Water from the reservoir at the Ash Fork Dam was used primarily for the supply of boiler water to locomotives of the Santa Fe Pacific Railway Company at Ash Fork, but at the same time it was used to supply water to engines of the Santa Fe, Prescott, & Phoenix Railway and the town of Ash Fork. This dam was one of the few steel dams ever constructed in the

United States and represents an engineering innovation that rapidly passed from the American scene.

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Project

Information: The Ash Fork Steel Dam was inventoried for the Historic American Engineering Record as part of the Southwest Water Resources Project, a joint project with the Texas Tech Water Resources Center. The survey was subsequently published as *Water for the Southwest: Historical Survey and Guide to Historic Sites* by the American Society of Civil Engineers in September 1973.