

HOOVER DAM, U.S. CONSTRUCTION RAILROAD
(Boulder Dam)
(Boulder Canyon Dam)
U.S. Highway 93
Boulder City vicinity
Clark County
Nevada

HAER NV-27-Q
NV-27-Q

HAER
NV-27-Q

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
PACIFIC GREAT BASIN SUPPORT OFFICE

National Park Service
U.S. Department of the Interior
1111 Jackson Street
Oakland, CA 94607

HISTORIC AMERICAN ENGINEERING RECORD
HOOVER DAM, U.S. CONSTRUCTION RAILROAD
HAER NO. NV-27-Q

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Location: U.S. Highway 93
Vicinity of Boulder City
Clark County
Nevada

USGS Hoover Dam, Nevada-Arizona 7.5 Minute Provisional 1997
UTM Coordinates: 11.0703777.3987982 (start)
11.0703117.3988304 (middle)
11.0703132.3987956 (end)

Date of Construction: 1931

Engineer: Lewis Construction Company

Builder: Lewis Construction Company

Present Owner: U.S. Bureau of Reclamation, Boulder City, NV

Present Occupant: Not Applicable

Present Use: Hiking trail

Significance: The U.S. Construction Railroad was one of three railroads built and operated specifically to support construction of Hoover Dam and the power plant at the toe of the dam.

Report Prepared by: Associated Cultural Resource Experts (ACRE)
8341 Sangre de Cristo Road, STE 202
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Date: April 2004

HISTORIC AMERICAN ENGINEERING RECORD

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Statement of
Significance:

The U.S. Construction Railroad was one of three railroads built and operated specifically to support construction of Hoover Dam and the power plant at the toe of the dam.

Description:

The U.S. Construction Railroad (USCRR) was the eastern and final link in the rail system from Las Vegas to Hoover Dam. The USCRR began at the terminal rail yard of the Union Pacific Railroad's Boulder City Branch Railroad at Summit (Boulder City) and extended northeastward about 10 track miles to a point near the Nevada side of Black Canyon, above the construction site of Hoover Dam. In the first seven track miles east of Summit, the USCRR descended within the upper reaches of Hemenway Wash, which is a wide drainage that slopes gently to the east to the Colorado River (now Lake mead). In the remaining track mileage to Hoover Dam, the USCRR passed through mountainous terrain with extreme slopes.

The USCRR descended from about 2,500' above mean sea level at Summit to about 1,390' near Black Canyon. To obtain slopes satisfactory for safe operation of the railroad, the route in the western seven miles included an S-turn switchback northeast of Summit, a major curved fill, and several cuts along and through rock slopes. The eastern three miles of track was built mostly on cuts and fill on the north slope of a rugged mountain ridge. This segment included five tunnels through rock spines and ridges. The railroad ended at a curve around a knoll above the dam construction site, to the immediate west of the current Hoover Dam electrical switchyard complex.

The USCRR was a single-track road throughout its length. The eastern terminus of the USCRR included a wye, from which a spur track led to a small car yard and the Hi-Mix concrete plant on the canyon wall. A second spur track from the wye descended along the center of the highway route to the lower level of the Hi-Mix plant and along the canyon wall to the Nevada spillway area. The latter spur was used to transport concrete that was placed in the dam structure by means of stationary and moving cableways. Boxcars and large pieces of equipment were also lowered about 700' from this spur to the power plant level by means of a 150-ton cableway. Neither of the spur tracks remains.

The documented segment of the USCRR is the loop at the eastern end of the railroad, in Section 29, T22S-R65E. This segment exists as a single-track roadbed that declines generally from west to east around a prominent hill. The grade includes three cuts through rock ridges, a massive fill up to 75' high across a natural wash, an elevated roadbed along the east side of the hill, and two areas adjacent to the roadbed that have been leveled and filled for use as equipment and material storage. Ties and rails are no longer extant on the roadbed, but discarded ties lie on fill flanks. Stone and concrete block foundation remnants of a ca. 1942 aggregate sorting facility are embedded in the east roadbed embankment at the easternmost point of the railroad loop.

The remainder of the route was mostly through extremely rugged mountains, where virtually every foot of the rail line required large cuts, fills, or tunnels. For nearly two miles, the rail line was built into the north side of a mountain ridge or series of ridges, and in this segment five tunnels were required. The tunnels varied in length from 165' to 415', totaling about 1,485' of tunnel in the entire segment. Four of the tunnels were straight-bore or tangent tunnels, but Tunnel No. 2 was a curved bore along its 150' length. Tunnels were built with nearly vertical walls and arched crowns, and in many places the walls and crowns were reinforced with vertical wood ribs and cribbing to stabilize fractured rock. The tunnels were unusually high (27') and wide (18') to allow passage of oversize equipment and materials on rail cars. All of the tunnels were timbered and lagged, with the roof constructed with five timber segments on 9' radii. Tunnel excavation totaled 26,000 cubic yards of stone.

Fills between the tunnels varied from 100' to 140' in height, and open cuts were up to 120' in depth. The most difficult task in construction of the tunnels, fills, and cuts in this area was gaining access to the construction sites. The railroad contractor built seven miles of roads from the construction camp to reach these sites, and in many areas these roads were extremely steep and difficult to build. Roads to Tunnels 1 through 4 were each about a half-mile long, but the road to Tunnel 5 was more than 2 miles long and had grades in excess of 15%. The latter road was 12' wide, and its construction included blasting out of 8,000 cubic yards of rock. The contractor used three shifts and six powder gangs during construction of the road, and the road still took 21 days to complete. The blasting crews were followed by a gasoline-driven shovel, which excavated the broken rock. The road was so steep in places that trucks could not back up to the shovel, and workmen packed fuel, oil, and other supplies to the shovel. This road was subsequently also used by Six Companies, Inc. and by the contractor building the highway from Boulder City to the dam site.

To the east of the tunnel segment, the USCRR exited a long cut at a point called Bechtel, which was named in honor of a principal of Bechtel-Kaiser, one of the constituent companies of Six Companies, Inc. At this location, Babcock & Wilcox Company erected a plant to fabricate the 44,000 tons of huge pipes needed for lining tunnels, penstocks, and outlet works. A switch at the east end of the plant allowed rail cars to be backed onto at least two short side tracks for delivery of steel plates used in the pipes. At the Bechtel location, the plates were bent and welded into pipe sections. Many steel pipes needed for Hoover Dam were too large to be transported by road or railroad from manufacturers' established plants, and the pipe sections would have been too large to be transported from the Bechtel plant to the rim of Black Canyon on railroad cars or on the highway on a special caterpillar-drawn trailer.

To the east of the Babcock & Wilcox Company plant, the railroad descended through massive cuts and fills to a curve around a knoll to the west of the Hi-Mix concrete mixing plant. A wye at the eastern end of the railroad allowed rail cars to be sited on two tracks. One track extended eastward to a small car yard and then to a cantilevered trestle adjacent to aggregate hoppers that fed the concrete mixing plant. Aggregate materials of various sizes could be unloaded directly into the hoppers, allowing virtually non-stop concrete production. The Hi-Mix plant provided all of the concrete for the top 250' of the dam and a portion of the concrete for the middle 255'; it also provided all concrete for the power plant and spillway structures. The small rail yard and spur track to the Hi-Mix plant were removed in 1937 to allow construction of an electrical switchyard for the Metropolitan Water District of Southern California.

From the wye at the eastern end of the USCRR, a second spur track entered the route of the Government Highway, which descended by switch-back to the level of the bottom of the Hi-Mix plant. A double track then followed the roadway cut for 1,500' along the canyon wall to near the midpoint of the Nevada spillway structure. Small, battery-powered locomotives moved specially designed flatcars along the canyon wall, carrying 8-cubic-yard concrete buckets to positions below

cableways. The cableways picked up the buckets, moved the buckets laterally, and lowered the buckets to pouring points in the growing dam structure, the power plant, or the spillway structures. Three one-engine, one-car trains serving the Hi-Mix plant delivered concrete for nearly continuous pouring.

This spur and a 150-ton cableway in part replaced a proposed inclined railroad that would have descended some 750 vertical feet within a tunnel from the main USCRR loop to near river level at the downstream portals of the Nevada diversion tunnels. The need for the inclined railroad was also partly addressed by driving a tunnel from the Nevada side of the power plant to near the downstream portals, where a Six Companies, Inc. road terminated. This spur was not included in the bid specifications for the USCRR, and it may technically have been part of the Six Companies, Inc. temporary railroad system for building the dam. However, this spur probably outlasted the spur to the Hi-Mix plant because it provided rail access to the 150-ton crane that was used to lower turbines, generators, and other materials to the level of the power plant. This spur was removed at an unknown date, possibly after the last generating unit was installed in 1961.

In total, the construction of the 10.28-mile roadbed included excavation of 380,000 cubic yards of loose earth and gravel, 280,000 cubic yards of rock for the roadbed (excluding the tunnels), and hauling of about 2,000,000 cubic yards for earth and rock for fills and the raised roadbed. Maximum allowed curvature was 10 degrees. The roadbed was graded to a typical width of 16' on fills and 20' in cuts, with a maximum curvature of 10 degrees on curves. A 6" gravel cushion was placed on the roadbed in rock excavation. On top of the roadbed, tracks were built with 90-pound relay rails plated onto untreated fir ties. The tracks were fully ballasted with 20,400 cubic yards of gravel obtained from pits in Hemenway Wash near the midpoint of the railroad. Long-haul fill was also obtained from pits in Hemenway Wash for use in areas where normal borrow operations were impractical, most significantly in the tunnel segment.

Actual construction varied somewhat from the original design for the railroad. Government specification for the railroad included provision for wood trestles, but no such trestles exist on the USCRR. The trestles may have been intended to be temporary structures to be used during construction of fill areas, and remnants of trestles could exist within some major fill. The specifications also included provisions for rock paving and steel-reinforced concrete wing walls and aprons for supporting steel culverts. Steel culverts were used in the construction, but rock paving and concrete wing walls apparently were not installed. According to the specifications, corrugated steel culverts with diameters of 24", 30", 36", 42", 48", and 60" were to be installed.

History:

Completion of the Union Pacific's Boulder City Branch Railroad allowed the government to begin construction of its railroad from Summit or Boulder City to Black Canyon before the contract for construction of the dam was awarded. On January 28, 1931, the Lewis Construction Company was awarded a contract to build the USCRR (also called the U.S. Government Construction Railroad, the Government Railroad, or the U.S. Railroad) for \$455,509. Lewis Construction Company subcontracted boring and lining of the five tunnels to Joseph Gorden of Denver, but all other construction was done by Lewis Construction Company personnel. Construction of the line began on March 1, 1931, and despite extremely difficult conditions the line from Summit to the dam site was completed and ready for operation by the first week of September 1931. Because the Bureau of Reclamation provided most materials and some changes were made during construction, the actual total cost of the railroad was \$635,000, of which over \$460,000 was for labor.

Construction of the USCRR was scheduled to begin on February 13, 1931, but the contractor did not receive notice to proceed until February 14. Despite this delay, construction proceeded on schedule. The construction workforce consisted of 125 to 300 men, who normally worked one of two daily shifts (except for the access road construction workers mentioned above). To support

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two daily shifts (except for the access road construction workers mentioned above). To support construction of the entire USCRR, Lewis Construction Company a camp in lower Hemenway Wash, as described below.

As the heavy construction was on the lower end of the railroad the contractor selected a location about midway on that section at the foot of the mountain range extending along the south side of the wash (Hemenway Wash) for his construction camp and base of operations. The camp was accessible from the highway which skirted the base of another mountain range on the north side of the wash, two miles distant, which made it possible for the workers employed on the upper end of the line to get in and out of the camp without excessive hardships or too much loss of time.

The highway referred to above was the Six Companies, Inc. paved road from Boulder City to the boat landing at the head of Black Canyon. The location of the construction camp was subsequently inundated by Lake Mead. During its occupation, the camp included a large wood frame commissary/mess/office building, at least 20 small wood frame cabins, and many tents. Life in the camp was difficult because of the desert heat, which remained above 100 degrees at night and rose much higher in the daylight during the midsummer of 1931. Water for the workers was hauled from Las Vegas. The mess hall was run by the Anderson Company, which also ran mess halls for Six Companies, Inc. employees at Boulder City and at the River Camp in Black Canyon.

Immediately upon completion of the USCRR in early September 1931, the government leased the railroad to Six Companies, Inc., the general construction contractor for Hoover Dam. Six Companies provided all rolling stock and personnel for operating the USCRR. The company was responsible for maintaining and repairing the railroad and for constructing and maintaining any passing sidetracks or spurs. At the time the USCRR was completed, Six Companies was building its own temporary railroad system that ran from an intersection on the USCRR to a massive sand and gravel source upstream from the dam construction site. The company operated the two railroads essentially as a combined entity, using a variety of locomotives and other rolling stock leased and purchased from other railroads.

The USCRR began delivering machinery and materials to Nevada rim of Black Canyon soon after its completion, but the high period of activity on the railroad was during actual erection of the dam in 1933-1936. Cement and other materials arrived at the switchyard at Boulder City and were then either taken directly to the dam construction site or were temporarily stored in Six Companies or Bureau of Reclamation warehouses or outdoor stockpiles. The USCRR operated almost entirely as a freight line; workers were trucked from Boulder City to the job sites, and tourists were taken by bus and automobile to viewing sites. One notable exception occurred in March 1934, when the nation's first streamlined train was allowed to travel USCRR and Six Companies, Inc. Railroad tracks to the face of the rising dam in Black Canyon.

In February 1936, Six Companies completed its work on Hoover Dam, and the consortium's member companies moved on to other dam projects in the west. Operation and maintenance of the USCRR reverted to the Bureau of Reclamation. Although the dam structure and the basic power plant structure were complete, very little of the planned installation had been completed for the massive electrical generating units or the switchyards needed to control transmission of the power. Aggregate materials had been stockpiled in Hemenway Wash for use in subsequent construction, and the Bureau of Reclamation purchased a two-mile segment of the Six Companies, Inc. Railroad to access these materials. Reclamation continued to operate the USCRR with a 65-ton diesel-electric locomotive, a 30-ton mechanical-drive locomotive, and at least four rail cars.

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When Six Companies left Hoover Dam, the company dismantled the Hi-Mix concrete mixing plant that had provided more than half the concrete for the dam and power plant structure. Reclamation constructed a much smaller concrete mixing plant on the site of the Hi-Mix plant in 1937 and placed it in operation in July of that year. This mixing plant remained in place and could be served by the USCRR until at least 1950 (Bureau of Reclamation 1937:95, 1950:44). In the spring of 1942, a need arose for substantial amounts of concrete for construction of electrical power switchyards and related features. A small aggregate washing and screening plant was built between the Metropolitan Water District electrical switchyard and the USCRR, and two short spur tracks were built for loading and unloading gravel. A gravel storage hopper was also built immediately adjacent the main USCRR track.

After the dam was completed, the USCRR was needed principally to convey heavy turbines, generators, and other equipment for the power plant generating units. Installation of the generating units was initially planned to be a steady, gradual process over many years, to meet anticipated demand growth. However, the demand for electricity in California grew dramatically in the late 1930s and early 1940s, and the additional demand of war industries during World War II further increased the urgency of completing the Hoover Dam facilities. By 1944, 13 of the planned 17 generating units had been completed and brought on line. Three additional generating units became operational in 1952, and the final generating unit became operational in 1961.

Installation of the last generating unit essentially ended the need for the USCRR. The last car was hauled over the rail line on December 1, 1961. In May 1962, the rails and rolling stock were sold, and the rails were salvaged during the summer of 1962. During its 31 years of operation, the USCRR had transported about 35,000 carloads of materials to Hoover Dam, or about 2,000,000 tons of freight. Most of the route of the USCRR was within the boundaries of the Lake Mead National Recreation Area, and these segments of the remaining railroad had come under the management of the National Park Service. The segments within a reserve around Hoover Dam remained under the management of the Bureau of Reclamation, and the segments within the incorporated boundaries of Boulder City became city property. Some of the latter segments have subsequently become private property.

Sources:

This documentation of features of Hoover Dam and associated structures was accomplished by Associated Cultural Resource Experts (ACRE). ACRE completed documentation of 21 features in October 2002. Documentation on four linear features was extended and an additional 3 features were newly documented in February 2004. Both phases of documentation were conducted as part of the historical/engineering recordation of Hoover Dam—prepared for the Department of Energy, Western Area Power Administration; Bureau of Reclamation; and Federal Highway Administration—that includes a narrative for the Addendum to Hoover Dam and individual documentation of 25 features located at the Hoover Dam facility, photo documentation, and documentation of existing historic photographs and site plans. The recordation conforms to the standards of the Historic American Engineering Record, U.S. Department of the Interior. Other reports in the HAER collection completed for these projects are a narrative for the Addendum to Hoover Dam (NV-27) and 24 short forms for individual structures: Hoover Dam, Los Angeles Switchyard (NV-27-A); Hoover Dam, Southern Sierras/CEP/Southern California Edison 138-kV Switchyard (NV-27-B); Hoover Dam, Metropolitan Water District Switchyard (NV-27-C); Hoover Dam, State of Nevada Switchyard (NV-27-D); Hoover Dam, Southern California Edison 230-kV Switchyard (NV-27-E); Hoover Dam, Arizona-Nevada Switchyard (NV-27-F); Hoover Dam, Static Towers and Lines (NV-27-G); Hoover Dam, Los Angeles Relay Control Building (NV-27-H); Hoover Dam, Switchyard Fire House (NV-27-I); Hoover Dam, Promontory Water Tank (NV-27-J); Hoover Dam, Control Cable Hoist House (NV-27-K); Hoover Dam, Transformer Circuits 1-15 (NV-27-L); Hoover Dam, Los Angeles BPL Lines 1-3 (NV-27-M); Hoover Dam, Southern California Edison North and South Lines (NV-27-N); Hoover Dam, Hoover-Basic Magnesium North and South Lines (NV-27-O); Hoover Dam, Metropolitan Water District Line 1

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(NV-27-P); Hoover Dam, United States Construction Railroad (NV-27-Q); Hoover Dam, U.S. Highway 93 Nevada Segment (NV-27-R); Hoover Dam, Lower Portal Access Road (NV-27-S); Hoover Dam, Kingman Switchyard (NV-27-T); Hoover Dam, U.S. Highway 93 Arizona Segment (NV-27-U); Hoover Dam, Explosives Magazines (NV-27-V); Hoover Dam, Nevada Downstream Waste Tailings (NV-27-W); and Hoover Dam, Nevada Spoils Tunnel (NV-27-X); Hoover Dam, Henderson-Mead Transmission Line 2 (NV-27-Y).

Project

Information:

This documentation was prepared for three federal agencies: U.S. Department of Transportation, Federal Highway Administration (FHWA), Central Federal Lands Highway Division, Lakewood, CO; U.S. Department of Energy, Western Area Power Administration (Western), Desert Southwest Customer Support Region, Phoenix, AZ; and U.S. Department of Interior, Bureau of Reclamation (Reclamation), Lower Colorado Region, Boulder City, NV.

This documentation records certain transportation and electrical features associated with Hoover Dam before planned removal or alteration of some structures. FHWA plans to construct a bridge over the Black Canyon of the Colorado River about 1,500' downstream from Hoover Dam. The Hoover Dam Bypass Project would include realignment of U.S. Highway 93 on the Nevada and Arizona sides of Black Canyon. The project would include demolition, relocation, or substantial visual impact to a segment of U.S. Highway 93 on the Nevada approach to Hoover Dam, a segment of a former alignment of U.S. Highway 93 in Arizona, electrical transformer circuits in Arizona and Nevada, two electrical switchyards, a segment of the grade of the U.S. Construction Railroad, a stone gate structure for a dam construction and operations road, and six historic transmission lines. This documentation also records certain structures not directly affected by FHWA's Hoover Dam Bypass Project. Electrical transmission facilities at Hoover Dam are administered by Western, but these facilities are within a federal reservation administered by Reclamation. Documentation of electrical structures is intended to partially fulfill responsibilities of Western and Reclamation under Section 110 of the National Historic Preservation Act (As amended). Some electrical structures addressed by Western and Reclamation would be directly affected by FHWA's Hoover Dam Bypass Project, and all structures addressed by Western and Reclamation are functionally related and geographically near structures addressed by FHWA.

Project Manager and historian for the recordation was Kurt P. Schweigert of Associated Cultural Resource Experts. The photographers were Deborah Dobson-Brown and Douglas M. Edwards of Associated Cultural Resource Experts. This documentation was prepared on the basis of research conducted at Reclamation archives in Denver, CO, and Boulder City, NV; Western archives and files in Denver and Phoenix, AZ; the National Archives and Records Administration in Denver; libraries of the University of Nevada-Las Vegas; and the Western History Collection of the Denver Public Library. This documentation includes information contained in survey reports for the Hoover Dam Bypass Project Environmental Impact Statement, an evaluation of the Western switchyards at Hoover Dam, an evaluation of the Hoover Dam construction railroads, a National Register nomination for Hoover Dam, and other documents.

Historian:

Kurt P. Schweigert, Associated Cultural Resource Experts, 2004.

Hoover Dam Quadrangle
Prov. Fd 1997Boulder Beach
Quadrangle 1970