DAVIS DAM

Looking north during construction of Davis Dam. Arizona is on the right side and Nevada to the left. In the foreground are the temporary construction bridges. Demolished after the completion of the dam, there would not be another bridge built until 1987 when Don Laughlin built a public bridge downstream near his Riverside Casino.

Davis Dam was constructed from 1942 to 1952 as the third and final impoundment of the lower Colorado River by the Bureau of Reclamation. Together with Hoover Dam 67 miles upstream and Parker Dam 88 miles downstream, Davis Dam was built to provide flood protection, hydroelectric generation, and water storage for agricultural, industrial, and domestic use in the Southwest. Storage of water behind the dam and the regulation of water flow in the Colorado River below the dam allow the United States to comply with the Mexican Treaty of 1944, particularly annual delivery of 1.5 million acre-feet of water to Mexico in the Colorado River. Davis Dam was the only major dam in which construction included excavation of a new river channel, a portion of which became a through-dam forebay for delivery of water to the power plant and spillway.

Davis Dam is a rock and earth-fill gravity dam rising 200' above the lowest point of its foundation and 140' above the level of the Colorado River. The dam crest is 1,600' long between the Arizona and Nevada sides of Pyramid Canyon, and the 50' wide dam crest accommodates a

convergence of Arizona State Highway 68 and Nevada State Highway 163. Near the eastern end of the dam, a rectangular concrete forebay structure through the dam allows water to flow to the spillway structure at the southern end of the forebay. Water from the forebay also flows through penstocks to the power plant, which is a free-standing structure located to the south of the dam and to the west of the forebay. The highway is carried on a bridge over the upstream end of the forebay, though this was closed to the vehicle travel after the terrorist attacks of 9-11. A control building is located to the immediate west of the forebay and to the north of the power plant.

Davis Dam was the third dam constructed by the U.S. Bureau of Reclamation on the lower Colorado River to provide flood control, hydroelectric generation, and water storage for irrigation, municipal uses, and other uses. As a result of previous devastating floods on the lower Colorado River, several potential dam sites were investigated by the Reclamation Service (later renamed the Bureau of Reclamation) after the passage of the Reclamation Act in 1902. A potential dam site at the lower end of Pyramid Canyon was investigated in 1902-1903, but the site was extremely inaccessible, and the narrowness of the canyon made control and diversion of the river difficult. Completion of Hoover Dam in 1935 about 67 miles upstream allowed the Bureau of Reclamation (hereafter Reclamation) to regulate the flow of the river, thereby providing much more stable conditions for construction of a dam in Pyramid Canyon.

Reclamation initially called the proposed dam Bullshead, in reference to a large rock formation resembling the head of a bull near the lower end of Pyramid Canyon. The Secretary of the Interior authorized construction of the dam onApril26, 1941, under provisions of the Reclamation Project Act of 1939. The project was named the Davis Dam Project in honor of Arthur Powell Davis, who had been Director of Reclamation from 1914 to 1932.

From four potential sites in Pyramid Canyon, the dam location was chosen because: "(a) it had the best spillway location, (b) the canyon rim was higher, (c) a single structure would control both the ancient and present channel, and (d) preliminary designs and estimates indicated the cost would be considerably less than for the other sites. The final design scheme was that of an "earth and rock fill dam with a concrete gravity intake and spillway structure placed at the downstream end of a combined diversion and forebay channel;" the prescribed height of the structure ensured a high-water level an elevation of 647', to coincide with the level at the base of Hoover Dam. The arrangement of the dam and appurtenant structures was unusual in that the plan did not follow any of the lay outs

ordinarily employed in dam construction. The scheme included the digging of a new river channel around a stretch of the existing river, use of the materials excavated from this new channel to dam up the canyon, and the construction of concrete control structures across the newly created channel.

Davis Dam was constructed in three phases. The first phase included the excavation of the diversion and forebay channel and completion of the forebay concrete structures to at least elevation 550' above mean sea level prior to initial diversion of the river. Diversion of the river was the beginning of the second phase, which included excavation and de-watering the dam foundation and constructing the dam's earth embankment and finishing the concrete placement operations on the forebay channel structures. The third phase of dam construction consisted primarily of completion of concrete work on the spillway.

On June 25, 1942, the U.S. government awarded a contract for construction of Davis Dam and Powerhouse to the Utah Construction Company of San Francisco, one of the six companies that had constructed Hoover Dam. Even though the United States was at war, Reclamation believed that priority could be obtained for purchase of critical materials and equipment for the dam. Initial work on the Davis Dam Project began in June 1942 with the construction of a railhead near Kingman, Arizona, temporary headquarters of Utah Construction Company near the railhead, improvement of roads to and around the project area, and initial construction of a workers camp and industrial plant downstream from the dam site. An agreement between the Arizona State Highway Department and Utah Construction Company allowed the company to improve an existing eighteen-mile-long road through Union Pass westward from Kingman, Arizona, at the company's expense, and provided for building of the new highway about eight miles long to the river, with the state contributing $50,000 to the new highway project.

Preparatory work for dam construction began on September 12, 1942, including drilling and blasting of rock in the diversion and forebay channel, forebay structures, and powerhouse location. Excavation of materials in these areas continued throughout the remainder of September and most of October 1942. To provide electricity and communications to the dam site, a transmission line was constructed to tie in to an existing line from Hoover Dam to Needles, California, and a link was constructed from a transcontinental telephone line north of the dam site. On October 27, 1942, the War Production Board revoked priority ratings required for obtaining necessary construction materials for the Davis Dam Project, and no further

work was undertaken for the duration of World War II. On February 20, 1943, Reclamation formally terminated the contract with the Utah Construction Company for construction of the Davis Dam and Powerhouse.

In 1945, with the war over in Europe and Asia, the federal government resumed its domestic public works program. During the war, the United States had signed and ratified the Mexican Water Treaty, guaranteeing 1.5 million acre-feet of Colorado River water be delivered to Mexico annually. Water storage behind Davis Dam would allow the treaty provisions to be met. On January 15, 1946, Reclamation awarded a new contract to Utah Construction Company, and the company received a notice to proceed on March 22, 1946.

The power plant was initially planned to be located downstream from the dam spillway structure, but explorations below the footing levels revealed the existence of two major fault zones at varying depths under the power plant intake structure locations, and also disclosed the existence of soft rock, crossed by faults, decayed zones, and slip seams, in the spillway area. Consequently, the power plant was relocated upstream from the original planned site, and the intake structure was rotated in a clockwise direction, swinging the north end away from the power plant onto a firmer foundation. Extensive grouting was also done under all the major structures.

In February 1947, the excavation was completed for the river diversion channel, the forebay channel, and foundations for the spillway and intake structures. By the end of 1947, the foundation grouting of these structures was finished, allowing actual construction to begin. Large-scale concrete placing operations began for the spillway and outlet structure in January 1948, and concrete placing for the intake structure began in February 1948. The river was diverted in June 1948; de-watering of the dam site took place over the following three months, and placement of the dam embankment material commenced in September 1948. By April 1949, the dam embankment had reached its completed height. The spillway was completed in October 1950.

Power plant construction paralleled that of the dam. The semi-outdoor type power plant contained Francis-type, 62,200 horsepower turbines and vertical-shaft generators, served by five main power transformers and three single-phase transformers. On January 5, 1951, Reclamation placed Unit 1 of the Davis power plant into service, when, from his office in Washington, D.C., Secretary of Interior Oscar Chapman pressed a telegraph key that transmitted the signal to Davis Dam, energizing power operations. Two weeks later, Unit 2 started for the

first time, but its thrust bearings quickly overheated and the equipment failed. Maintenance crews put Unit 2 back into service by mid-April 1951. The remaining three generating units went on line from mid-April to mid-June 1951. The Davis 230-kV switchyard and transmission lines were fully operating facilities by the end of 1951.

The Davis Dam complex was designed with two major electrical switchyards: a 230-kV facility that would serve large transmission lines and interconnect with other Bureau of Reclamation power plants at Hoover Dam and Parker Dam, and a 69-kV switchyard that would interconnect primarily with regional distribution systems. In general, development of the 230kV switchyard design followed the changes that occurred during the development of the power plant design. The location of the 230-kV switchyard was first planned for the Nevada side, but the only feasible site for the large switchyard on the Nevada side was too distant from the power plant. Also dismissed was a site west of the forebay channel, where the utility building and visitor parking lot currently exists. The site finally chosen for the 230-kV switchyard was on the Arizona side of the canyon, to the southeast of the forebay structure; this location provided adequate terrain and space for approach of transmission lines. In part because it was located on the canyon slope, the 230-kV switchyard was designed to have upper and lower levels within a rectangular configuration. The 69-kV switchyard was located on a rock bench, down slope to the northwest of the 230-kV switchyard.

The Utah Construction Company performed the excavation and grading for the switchyard plan, as well as the construction of a concrete control cable tunnel and conduit from the power plant to the switchyards. The firm of Donovan-Wismer-James and Becker completed construction of the 230-kV switchyard in mid-1951. The 69-kV switchyard and transformer circuit were completed by the George E. Miller Company in 1952. In May 1951, Utah Construction Company finished removing all temporary camp and plant buildings. On December 1, 1951, the essential aspects of the Davis Project—the dam, reservoir, and forebay and power plant structures—also were transferred to operations and maintenance status. The following year, many of the smaller project elements, including the dam elevator, outside lighting, utility building, communication facilities, and the forebay channel bridge, were completed and transferred from construction to operations and maintenance status. On December 10, 1952, the Davis Dam and Powerplant was officially dedicated.

The flood gates of Davis Dam have only had to be put to use once in its history. A gross miscalculation in 1983 of snowmelt volume in Colorado

resulted in every dam on the Colorado River having to open their flood gates to relieve the pressure being put on the dam structures. This created widespread flooding in many areas downstream when the river returned to its original riverbed that had been developed for farm land, residential areas, and businesses.

Excerpts from:

HISTORIC AMERICAN ENGINEERING RECORD
National Park Service
U.S. Department of the Interior
1849 C Street NW
Washington, DC 20240-0001