Taming the Missouri: Fort Peck Dam

In 1933 the site of the future Fort Peck Dam must have seemed an unlikely place for economic development. The remote northeastern Montana location lacked towns, railroads, and highways; the Missouri River had even washed away the old trading post that had given the place its name. By the end of the year, however, workers had begun migrating there to build what would become for a time the largest dam in the world.

The effort to tame the Missouri River can be traced to 1927, when Congress ordered the U.S. Army Corps of Engineers to study “those navigable streams in the United States, and their tributaries, wherein power development appears feasible and practicable.” In effect, Congress was asking the Corps to change the focus of its water management approach from individual projects to entire river basins. Captain Theodore Wyman, working in the Corps’s office in Kansas City, Missouri, rose to the challenge, conducting an in-depth study of the Missouri River and its tributaries, whereon power development appears possible.

Wyman’s report, completed in 1932, was initially received with skepticism. Critics argued that the cost of building the dam did not justify its benefits. But by the fall of 1935, when the Corps’s chief engineer, General Lytle Brown, transmitted the report to President Franklin D. Roosevelt’s secretary of war, times had changed. Job creation had become a top priority, and the dam project presented an opportunity to employ thousands of people in the depressed American West. The Roosevelt administration approved the plan in mid-October, and construction began within a matter of days.

It was an audacious enterprise. Upon its completion, the 21,026 ft long dam would reach a height of 250 ft above the riverbed, and contain an astonishing 125.6 million cu yd of earth. Building it would require seven years of sustained effort. At its peak, the project would employ more than 10,500 workers.

Before construction of the dam itself could begin, the place had to be made habitable. The government built a new town, Fort Peck, to house workers and their families. The settlement included residences, barracks, schools, stores, a hospital, a theater, and a mess hall. It was supplied with water, sewer, and electrical distribution systems, as well as a natural gas line for heat. Roads and sidewalks were paved. A new, 154,000 V, 50,000 kW power line stretched 288 mi from Great Falls, Montana. And, of course, the town was linked to the outside world by railroad.

The dam’s design was typical of other earthen dams of the period constructed in the same manner, although on a much larger scale. A 10,578 ft long earthen embankment stretched across the valley of the Missouri River, and an additional dike 10,448 ft long extended along the west bank. Deep within the foundation of the embankment lay a 10,000 ft long wall made up of steel sheet piles to control seepage. Anchored in a foundation of shale bedrock, the bottom of the wall reached an average depth of 100 ft. Fine-grained materials were concentrated in the center of the dam to form an impervious clay core, while coarser materials made up the outer sections. A layer of rip-rap on an 18 in. deep gravel bed protected the upstream face of the structure.

More daunting than the design was the logistical challenge of moving 125.6 million cu yd of earth. There was no shortage of sand, silt, and clay in the riverbed, but the Corps needed an inexpensive way to rapidly transport large quantities of the sediment to the dam site. For this task, the Corps chose the hydraulic fill method. This method had been pioneered in the 19th century by Californian miners who used pressurized water to wash away soil and rock and convey the resulting slurry through flumes or pipelines to facilities at which the gold could be extracted. By 1890 dam builders had begun to adopt a modified version of this technique. With construction carried out by hydraulic fill, sediment is dredged from the river bottom and pumped through long pipes to the perimeter. The coarsest materials settle first, forming the semiporous outer layers of the embankment. The finer particles, on the other hand, make their way to a “core pool” in the center. The water slowly drains out through the semiporous layers, leaving the fine particles behind to settle and form the dam’s impervious clay core.

At Fort Peck the dredging was accomplished by what the workers called the Fort Peck navy—a fleet of four electricity-powered dredge boats that were built at a makeshift shipyard on-site. The boats pumped the sediment diameter pipelines, some of which stretched more than 2.5 mi. Rock and fill for the outer layers of the embankment were transported to the site by railroad.

As the embankment took shape, crews blasted four diversion tunnels through a shale bluff on the river’s east bank. Each tunnel was lined with 3 ft of reinforced concrete and measured more than 1 mi long and 24 ft in diameter. On June 24, 1937, the river channel was closed and the entire flow of the Missouri River was diverted through the tunnels. After the project was complete, the tunnels remained capable of facilitating flood control and power generation.

Another major structure associated with the project was an enormous concrete spillway...
The Missouri River Dam, located 34 mi east of the dam. An approach channel up to 800 ft wide leads to a concrete gate structure at which 16 gates, each 25 ft high and 40 ft wide, regulate the flow. The gates rise vertically and discharge into a chute lined with reinforced concrete that is 800 to 1,200 ft wide and drops 215 ft. The chute discharges into an unlined stilling basin and a channel that rejoins the floodplain of the Missouri approximately 9 mi downstream of the dam. In combination with the four diversion tunnels, the spillway, which has a capacity of approximately 19 million acre-ft, has done its job for more than 70 years, setting a benchmark for others. Fort Peck Dam has done its job for more than 70 years, attributing the failure to a combination of factors. Whatever the precise causes of the failure, however, the Corps’s redesign of the dam must be deemed a success. Fort Peck Dam has done its job for more than 70 years, impounding a 134 mi long reservoir with a capacity of approximately 19 million acre-ft. It has accomplished its primary purpose of facilitating navigation on the Missouri, and its five turbines produce an average of 2.8 million kWh of energy daily.

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