

Coal Combustion Product Type

Fly ash

Project Name

Gross Reservoir Expansion Project

Project Location

Boulder County, Colorado

Project Participants

Denver Water, Eco Material Technologies, Kiewit Barnard (joint venture), Stantec, AECOM, and Black & Veatch

Project Completion Date

Summer 2027

Project Summary

Originally built in the 1950s, Gross Reservoir Dam is a 340-foot-high concrete structure that holds approximately 440 surface-area acres of water, supplying Boulder County and the city of Denver with robust water supplies and multiple recreational uses. After recognizing an imbalance in its overall water system, Denver Water, which owns and operates the reservoir, decided to raise the dam so as to enlarge the reservoir's capacity. Upon completion, the expansion project will make Gross Dam the tallest concrete dam in Colorado, nearly tripling the water storage capacity in the reservoir, from approximately 42,000 acre-feet to 119,000 acre-feet.

Project Description

Denver Water supplies water throughout Boulder County, Colorado. As part of its long-term planning goals, the utility determined that it needed a larger reservoir of water to prevent against drought and to address a vulnerability in its current system: 90 percent of the utility's water supply is stored to the south side of the city, while only 10 percent is stored to the north at Gross Reservoir.

The solution involved raising Gross Dam from its current height of 340 feet to 471 feet, which would make the structure the tallest concrete dam in Colorado. Denver Water began the preparation of the foundation in 2022 with the excavation of 260,000 cubic yards of rock and the placement of 27,000 cubic yards of concrete. In 2024, builders began raising the dam, with a goal of completing the project in 2027.

In keeping with its sustainability goals, Denver Water is using roughly 90,000 tons of Class F fly ash in its overall concrete production and placement. That fly ash, procured from Eco Material Technologies and sourced from the Prairie State Generating Station in Marissa, Illinois, will replace about 65 percent of the traditional cement used for producing concrete. The utility selected fly ash as a supplementary cementitious material because it makes the concrete mix more workable, meets the requirements to reduce heat of hydration, and reduces the effects of autogenous shrinkage. Not only does fly ash make finished concrete stronger and more durable, but it also reduces the need to manufacture as much cement, yielding significant greenhouse gas reductions.

The dam will be raised using 118 four-foot-high steps comprised of approximately 800,000 cubic yards of concrete. The concrete is produced on-site at a batch plant and

transported to the dam site by conveyor, where it is added to the structure using a process called roller compaction.

Roller-compacted concrete (RCC) typically uses more fly ash and has lower water content than conventional concrete. It also has lower curing temperatures, lower embodied carbon, and is less susceptible to cracking. The partial substitution of fly ash for portland cement is important in RCC dam construction because the heat generated by fly ash hydration is significantly less than that of portland cement hydration, which reduces thermal loads on the dam.



Photo courtesy of Denver Water