



Case Study
04

Fly Ash for California's Olivenhain Dam

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Fly ash played a large part in making California's first roller compacted concrete dam a huge success. With ISG's help, Kiewit was able to design a mix that will help the dam withstand natural disasters and provide needed emergency water and electrical supply.

The Olivenhain Dam will be the first roller compacted concrete (RCC) gravity dam in California and the tallest in North America. At 308 feet tall and 2,552 feet long, the dam used almost 1.5 million cubic yards of RCC and over 152,000 tons of fly ash. As the centerpiece of the San Diego County Water Authority (SDCWA) Emergency Storage Project, the dam is designed to survive a major earthquake and remain operational. The reservoir created will contain 24,000 acre-feet of water.



The SDCWA contracted with Kiewit Pacific to build the dam and the pozzolan supply contract was awarded to ISG Resources, Inc. Extensive testing and mix design evaluations were done to optimize the RCC with a very high fly ash content. Modeled after several other RCC dams worldwide, a high percentage of fly ash was used for exceptional long-term strength, lift bonding, durability and a high degree of impermeability. Lower permeability directly relates to less water seepage, a common problem encountered in RCC dam construction. The particle size and distribution of fly ash greatly decreases the permeability of an RCC dam. Class F fly ash supplied by ISG was used in all phases of construction, from testing to completion of the dam. The final mix - 1.42 million yards of concrete - contained over 65 percent fly ash, or up to 216 pounds of fly ash per yard of RCC.

RCC with high volume fly ash:

- Is less expensive to produce than conventional RCC
- Speeds dam construction
- Requires less water than conventional RCC
- Provides exceptional long-term strength and impermeability
- Reduces the heat of hydration and thermal cracking
- Is denser and easier to place and compact than conventional RCC

The use of fly ash in the RCC used for the Olivenhain Dam prevented the mix ingredients from segregating during delivery and compaction. Lift placement averaged 16 inches when placed and less than 12 inches after compaction.



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Because of ISG's commitment to provide consistent, high quality fly ash and ISG's logistical focus at key terminals and distribution points, Kiewit construction crews broke a U.S. record for placing RCC during the construction of the Olivenhain Dam. In two 10-hour shifts, the crews placed 16,057 yards of RCC! Kiewit was able to complete the dam well within schedule, while ISG continued to supply fly ash to its regular customers during the dam's construction period.

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This coal ash utilization case study is a selection of the Coal Combustion Product Partnership. For more information, consult the C2P2 web site at <http://www.epa.gov/epaoswer/osw/conserve/c2p2/>