International Milestone RCC Project

Olivenhain Dam

in USA

Dam	Height at maximum cross-section	97.1 m
	height above stream bed	86.0 m
	Crest length	783.3 m
	Crest width	6.1 m
	Parapet Wall Height	1.1 m (not part of the structural height)
	Crest Elevation	330.3 m MSL
	Volume of RCC in Main Dam and Foundation Shaping Blocks	1.11×10^6 m^3
spillway	type	wide-crest; no gates; 0.6-meter steps
	Top Elevation	329.3 meters, MSL
	Width	7.6 meters
	Energy Dissipation	Modified Type II Stilling Basin
	Flow Capacity	10 m^3/s
Inlet/Outlet Facilities	I/O Tower	6 openings/gates at various elevations; 3 large fish screens
	I/O Pipe through Dam	2.1 m (diameter) steel pipe
Reservoir (Off-Stream)	Storage Capacity at Spillway Crest	30.1×10^6 m^3
	Usable Storage	30.0×10^6 m^3
	Dead Storage	0.1×10^6 m^3
	Watershed Area	1.6 km^2
	Water Surface Area at Spillway Crest	0.8 km^2

Olivenhain Dam: A Model Project

The San Diego region's $150 billion economy and quality of life depend on water imported from hundreds of miles away. If an earthquake or other disaster severed pipelines that bring the region up to 95 percent of its water, most homes and businesses would run out of water within three to four days. To solve this problem, the ***San Diego County Water Authority*** is building the Emergency Storage Project (ESP), a combination of interconnected reservoirs that will make water available during emergencies. The cornerstone of the ESP is the Olivenhain Dam.

The US$200 million Olivenhain Dam, completed on time and within budget in 2003, is the tallest RCC dam in the United States and the first in California. It was designed and built to withstand a 7.25 magnitude earthquake on a major fault located 18km away, and remain operational after such devastating event. The main dam contains about 0.94×10^6 m^3 of RCC that was completed in just 6 months and set several world records for RCC placement at that time.

The project team used innovative planning, design, construction, environmental and communication techniques that have made the Olivenhain Dam a model project. The project approach set new standards for developing large dams in an urban area, while minimizing adverse impacts on the environment and local communities.

ASCE OCEA Award Group Shot

The project has received numerous awards from various national professional organizations. In 2005, the American Society of Civil Engineers issued an Award of Merit to the Olivenhain Dam for its worldwide *Outstanding Civil Engineering Achievement Award.*

Downstream of Olivenhain Dam

Successful Planning Sets New Standards

The approach employed a systematic, quantitative, and automated alternative evaluation tools that allow extensive input from all stakeholders in a most democratic way. The rate of expressed opposition to the project was less than one out of a million people, another record for permitting a large dam in an urban and environmentally sensitive community. The U.S. Society on Dams subsequently adopted the planning and public involvement methods used for this project as the model (guidance) for the planning of future dams in the U.S., and has recommended to ICOLD making them the international standard.

Working Smarter, Together

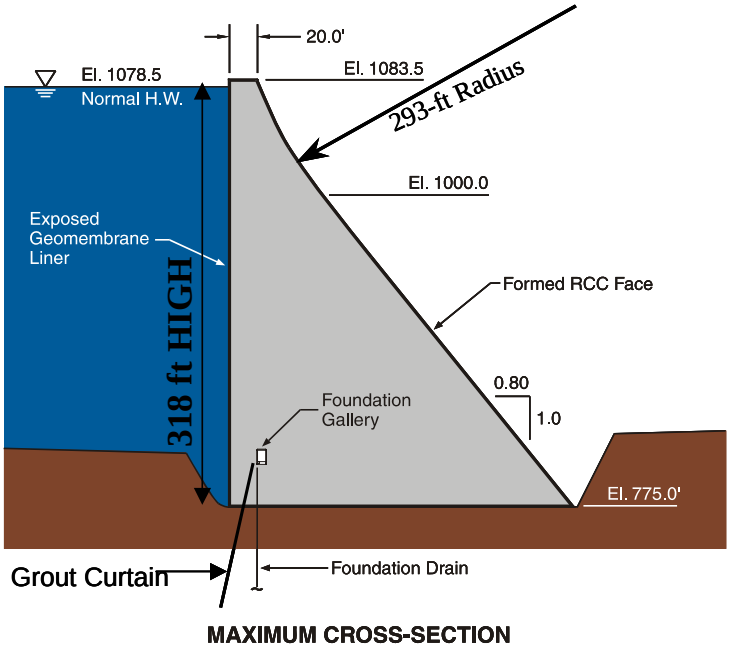
A partnering charter guided the contractors, regulatory agencies, and owners to a working relationship based on open communication, mutual respect, trust, and cooperation at all levels. As a result, several cost-saving improvements were made to the construction plan, including reducing permanent access roads, realigning piping and valving, and improving the RCC mix.

Olivenhain Dam is a multi-use project serving as both regional emergency water storage and local storage. Olivenhain Municipal Water District had a growing need for nearby water storage. The Water Authority partnered with OMWD to develop the project and share its benefits, optimizing use of resources, saving tens of millions of dollars, and minimizing adverse impacts on the environment.

On a regulatory level, the dam was the first RCC dam under the jurisdiction of the state dam safety regulator, the California Division of Safety of Dams. The Water Authority took a proactive approach in working cooperatively with the dam regulator, sharing all data on a nearly real-time basis, providing open access to the dam, and the on-site RCC testing laboratory.

Superior, by Design

The dam's many unique design features include a curvilinear downstream face to optimize the dam structural performance, a robust design for the dam's operational equipment to remain functioning following a catastrophic earthquake and a smoothly varying foundation to eliminate sharp offsets that could cause cracking during an earthquake. The innovative foundation shaping blocks, the largest in the world, optimize the dam's lateral performance during a strong earthquake by minimizing differential movement between monolithic sections. Since its completion in 2003, the project has performed satisfactorily meeting the intent of design.



An exposed, flexible geomembrane PVC liner was installed on the upstream face of the dam to ensure the dam works after strong earthquakes. The liner was selected for its superior water tightness, little conflict with RCC construction, and its ability to move and stretch with the dam during an earthquake. More than 10 types were weighted using selection factors of safety, performance, economy, longevity and appearance. The liner system has been effectively blocked seepage through the dam, with a measured rate of seepage about 1,000 times less than other typical RCC dams, minimizing loss of water.

Time Is Money, and We Saved Both

A fast-track approach breaking the project into several "construction packages" reduced the overall contract duration by about one year. Packages allowed site development and dam foundation excavation to proceed on an expedited basis, while detailed dam design, environmental permitting, and regulatory review was underway. This fast-track, or staged,

approach also allowed the dam construction to proceed safely and efficiently on a relatively small construction site of less than one half of a square kilometer.

By using a high paste RCC mix coupled with a vigorous quality control program, Olivenhain Dam was constructed with high quality and at a high speed. The improved RCC mix and innovative grout-enriched vibratory RCC (GEVR) technique simplified the construction method. They resulted in almost 100 percent acceptance of RCC at the mixing plant, and allowed easy handling on lifts by a combination of conveyors, hauling trucks, vibratory rollers and other equipment. RCC was placed in two 10-hour shifts per day and 5.5 days per week, with average daily rates ranging from 8,400 to 9,200 m3. In June 2002, the RCC placement reached the highest speed of 12,300 m3, setting the world record at that time. About 0.94x106 m3 of RCC for the main dam was placed in six months, nearly three months ahead of schedule; it saved money.

More Than a Dam, an Environmental Resource

The Water Authority formed partnerships with various local, state and federal agencies to create the 750-acre Elfin Forest Recreational Reserve. Many of the hiking, bicycling, and equestrian trails remained open to the public during construction, and a permanent overlook was created where community members could view the dam and reservoir during and after construction. Wildlife and natural resources at the reserve are closely monitored and will be preserved for many generations to come.

Wall of Awards

Companies Involved in the Project

Submitter: San Diego County Water Authority
Owner: San Diego County Water Authority
Co-Owner: The Olivenhain Municipal Water District
Civil Engineer of Record: Parsons-Harza, Joint Venture
Construction Manager: The Washington Group
Planning Engineer: Gei Consultants
Foundation Excavation: Ladd & Associates, Inc.
Dam Construction: Kiewit Pacific Company
Environmental Planning and Compliance: Edaw Environmental
Public Relations: Katz and Associates
Regulatory Agency: California Department of Water Resources

Truck on Dam (RCC Placement near Top)

其他可用图片

Olivenhain Reservior

Perspective View of Olivenhain Reservoir

Construction Site

Construction Site