

## Roller Compacted Concrete Dams and Spillways International Technical Seminar and Study Tour, May 7-18, 2012 - Denver, Colorado, USA, with site visits to Arizona, California and New Mexico

**Introduction/Seminar Objectives** - The use of RCC in the construction of dams and spillways has become increasingly widespread. RCC techniques are popular for safety of dams modifications, including buttressing concrete dams, rehabilitation of spillways, and overtopping of embankment dams. RCC construction techniques combine the safety, aesthetic, and maintenance advantages of concrete dams with the low cost and high production rates normally associated with earth or rockfill embankment dams. Through lectures, discussions, hands-on laboratory testing, and site visits, led by RCC experts, participants will receive practical training and gain an excellent understanding of the advances in RCC materials, mixtures, and construction operations that facilitate the rapid production rates of RCC dams and spillways.

**Who Should Attend** - The seminar is designed for managers, administrators, engineers, and geologists responsible for the design, construction, operation, maintenance, and safety of dams. Policymakers and planners, as well as those with technical responsibilities, may also benefit from the seminar. All presentations, discussions, and printed materials will be in the English language. Participants should have a good command of general and technical English usage.

**Seminar Topics** - The first week, May 7-11, 2012, will take place in Denver, Colorado, and will consist primarily of classroom and laboratory presentations and discussions. Lectures, case histories, structured discussions, and hands-on testing covering materials, mixtures, and construction of RCC dams and spillways will be led by technical experts from Reclamation and others involved in current, state-of-the-art RCC techniques.

**Study Tour** - From May 13-18, 2012, participants will visit the States of Arizona, California, and New Mexico, with site visits to:



**Santa Cruz Dam**, built in 1929 by the Santa Cruz Irrigation District, the original dam is 46 meters high, has a crest length of 163 meters, a width of 27 meters at the overflow spillway. The lake covers 48 hectares with water in the foothills of the Sangre de Cristo Mountains of New Mexico and provides recreational opportunities for fishing, boating, and camping. In 1988, Reclamation was contracted by the New Mexico Interstate Stream Commission to design and construct a RCC stability buttress to protect against several safety deficiencies.



The dam was suffering from severe freezing and thawing deterioration, the spillway could only pass a 10 year flood, and the dam could fail during the maximum credible earthquake (MCE) seismic event. The stability buttress was designed to pass a 25 year flood event through a new stair-step spillway, the dam and foundation could withstand overtopping by the probable maximum flood, and the dam could withstand the MCE. The arch RCC buttress was the first of its kind in the United States and also involved many unique features. For the first time, Reclamation specified air-entrained RCC for greater freezing and thawing protection. The RCC was mixed in a continuous mixing plant, transported to the dam by conveyor, and placed during the winter months of late 1989 and early 1990. A new outlet works was provided in the center of the dam, accessed by a gallery constructed by shotcrete over an inflated balloon form.

**Many Farms Dams and Dikes**, located on the Navajo Indian Reservation in northeastern Arizona. The dam, originally built in 1943, is constructed across the Sheep Dip Creek, and is essentially an off-stream storage facility, consisting of a main dam, three dikes, a spillway, and an outlet works. Reclamation provided the design and construction management for the Safety of Dams modifications which were completed in 2001. The Many Farms Dam Project involved repairing the main dam and three saddle dikes with filter systems and new impervious embankment. A new roller-compacted concrete emergency spillway along the outlet works also was part of the project. A telescopic conveyor was used to transport the fresh RCC to all parts of the spillway and specially fabricated back-hoe mounted plate compactor was used to compact the outer side slopes of the exposed RCC.



**Hoover Dam**, spanning the Arizona-Nevada state line, is located in the Black Canyon of the Colorado River about 56 kilometers (35 miles) southeast of Las Vegas, Nevada. It is a concrete thick-arch structure, 221 meters high (726.4 feet) and 379 meters long (1,244 feet). The dam contains 2.48 million cubic meters (3.25 million cubic yards) of concrete; total concrete in the dam and appurtenant works is 3.36 million cubic meters (4.4 million cubic yards). Built during the Depression; thousands of workers and their families came to Black Canyon to tame the Colorado River. It took less than five years, in a harsh and barren land, to build the largest dam of its time. Now, years later, Hoover Dam still stands as a world-renowned structure. The Dam is a National Historic Landmark and has been rated by the American Society of Civil Engineers as one of America's Seven Modern Civil Engineering Wonders.



**Red Rock Detention Basin**, was built in three phases. The first phase was completed in 1987 and included excavation of the impoundment area and construction of the embankment, ogee crest spillway and reinforced concrete box culvert structure with trash rack. The second phase was designed as part of a U.S. Army Corp of Engineers project and included an expansion of the impoundment area, increased embankment height, construction of the second ogee crest spillway and an orifice plate was placed on the outlet structure to reduce outflow. Construction of this phase was completed in 1996. The last phase was also a U.S Army Corp of Engineers project and included the stepped RCC inflow structure along the west edge of the impoundment area. This facility was completed in 2001.



**Olivenhain Dam and Reservoir**, the first roller compacted concrete dam built in California, at 97 meters high, the dam was designed to both withstand and remain fully functional during and after an earthquake, to keep water flowing into the region. The dam is the cornerstone of the San Diego County Water Authority's (SDCWA) Emergency Storage Project, a system of reservoirs, interconnected pipelines, and pumping stations designed to make water available to the San Diego region in the event of an interruption in imported water deliveries. The dam is currently the highest RCC dam in the United States though it will soon be surpassed by the SDCWA modified San Vicente Dam scheduled for completion in 2012.



**San Vicente Dam**, owned and operated by the City of San Diego, currently stands at 67 meters high. The SDCWA will raise the dam an additional 35.6 meters – the tallest dam raise in the United States and the tallest of its type in the world. The raised dam will store roughly an additional 188,000,000 cubic meters of water, more than doubling the reservoir's water storage. The downstream side of the existing dam will be completely covered by roller-compacted concrete and will be built to remain operational in the event of a major earthquake. Preparatory work is underway with expected completion in 2013.

**Costs and Registration** - The registration fee is U.S. \$4500 per person. Various printed materials, lodging for 13 nights and transportation during the study tour is included. If applicable, it is recommended that individuals apply for visas and seek sponsorship as soon as possible. Funding is not available from the seminar organizers.

**Payment** - Checks should be in U.S. dollars and made payable to the Bureau of Reclamation. Credit card payment, which is the preferred method of payment, and wire transfers are acceptable (see registration form). **The registration form must be received before April 30, 2012. For registration forms received after April 30, 2012, the cost increases to \$4800.**

**Lodging and Transportation** - Hotel accommodations will be arranged by Reclamation from May 6 through May 18, 2012 (13 nights). The lodging cost is included in the registration fee and participants are expected to stay in the selected hotels. Any miscellaneous costs such as laundry, telephone/internet usage, etc. will be at the participant's own expense. **International travel should be arranged into Denver, Colorado, no later than May 6 and out of San Diego, California, no sooner than May 19. The Seminar will conclude with a close-out dinner and social evening on May 18, 2012, in San Diego, California.**

**Climate/Clothing Suggestions/Medical Insurance** - Participants should expect mild days and cool nights whereby a coat/jacket may be necessary. Casual clothing and work boots/sturdy closed-toed shoes are required on field tours. Accidental injury/medical emergency insurance is strongly recommended and should be purchased prior to arrival in the United States. Reclamation is not financially responsible for any illnesses or injuries that may be incurred by participants. Please refer to the following website for reference. <http://www.medexassist.com/Individuals/Products/travmedchoice.aspx>

**Further Information** - A confirmation letter will be sent by e-mail upon receipt of the registration form and payment. For additional information, contact International Affairs - Denver, Bureau of Reclamation, P.O. Box 25007, Denver, Colorado 80225, telephone 1-303-445-2127, fax 1-303-445-6322, e-mail inquires to [Lprincipe@usbr.gov](mailto:Lprincipe@usbr.gov) (Leanna Principe) or [Amedina@usbr.gov](mailto:Amedina@usbr.gov) (Angela Medina) or visit our website at [www.usbr.gov/international](http://www.usbr.gov/international).