Visit report 17/10/2016: Calaveras Dam Replacement Project

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On Monday morning October 17th, our first day of excursions in San Francisco, we visited the Calaveras Dam Replacement Project. The Calaveras Dam is located in the East Bay of the San Francisco Bay and is a part of the Hetch Hetchy Regional Water System which provides water for a large part of the Bay area. Since the dam is close to many different fault lines, the dam is now being upgraded to withstand seismic activity. The closest fault line is only about 1500 feet (457 meters) away from the dam, called the Calaveras Fault.

Our visit started with a presentation from Susan Hou, the project manager of the Calaveras Dam Replacement project. She works for the San Francisco Public Utilities Commission, which is the owner and operator of the Hetch Hetchy Water System and started this project. The presentation started by telling that in 1908 a 7.9 magnitude earthquake hit San Francisco which let the city burn for three days. Also due to a greater demand for fresh water a campaign and project was started to construct the Calaveras Dam being part of a larger water system. The water system providing water for 2.6 million customers in the Bay Area is a gravity feed system, so there are no pumps needed to get the water over 175 miles (281 km) to the homes and crossing three fault lines.

To always ensure basic water service within 24 hours to the customers, the existing dam will be replaced by a new earth and soil filled dam, just about 1000 feet (304 meters) in front of the existing dam, so the existing dam will also function as a border to let them have a dry working area during construction. The design phase and getting a contractor took about 10 years and construction is scheduled to take about 8 years, with the finish line in 2019. Until now the project is about 90% complete and already about 4 times over budget.

The dam will consist out of an earth filled dam, a large spillway, a stilling basin and several intake and outlet works. In about five years they have blasted out a lot of rocks in the area to create room for constructing the new dam. When we were on the construction site, the dam was not yet constructed since they were still preparing the foundation for the new dam. A pipeline below the dam and grout curtains to prevent seepage through the ground need to be installed before constructing the embankment. The embankment will have an impermeable clay core with adjacent soft and hard rock layers. In between these parts some sand layers will be used to avoid leaking materials, but also to be able to drain any water. No concrete is used for the dam, because it cannot take in a lot of movement caused by an earthquake.

Next to the dam, a spillway is needed to ensure the water level in the reservoir behind it will not overtop the dam. The spillway is designed to handle a 1 in 10000-year flood event and will therefore be 16 feet (4.8 meters) lower than the dam. In contrast to the new dam, the spillway is made out of concrete since some cracks are allowed to form after an earthquake. At the end of the spillway a stilling basin is constructed to create a hydraulic jump to dissipate the energy. The last component and also last stop on the construction site were the intake and outlet works mainly controlled in the Intake Tower. This tower has been an architectural design, because it is the only part visible after the dam is finished.

During the design and construction phase they have been dealing with several challenges and unexpected issues. One of the issues which came up during the construction phase were two landslides when they were excavating parts of the observation hills. This issue let to delays, but also to changing the slope from 3H:1V to 2H:1V causing it to double handle the soil and needing another 250 million dollars. Another big issue was the environmental protection in this area. In order to get

approval for construction of California's fish and wildlife protection agency, they needed to build a fish passage to restore the former fish species, but it also helps to divert water in the reservoir. Another thing is that they need to report every time they will kill any threatened or endangered species during construction.

To finish up the project they will remove the existing dam for just one-third part, which is mainly the reason to reduce costs.