COFFERDAM ON STEEPLY SLOPING ROCK

Tulloch Hydroelectric Dam - Jamestown, CA

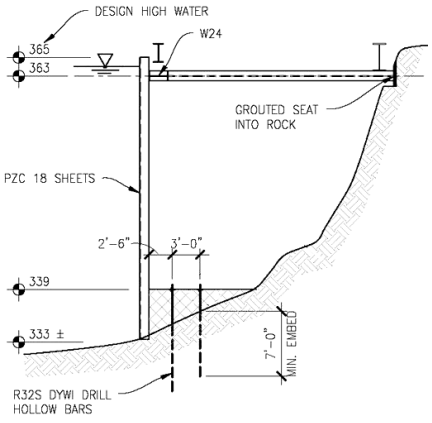
A new powerhouse at the existing Tulloch Hydroelectric site on the Stanislaus River in the western foothills of the Sierras Nevada Mountains of central California required a deep excavation in rock on the downstream face of the dam. A cofferdam was required to isolate the powerhouse construction site excavation from the existing Goodwin Reservoir and the turbulent discharge from the existing powerhouse. The cofferdam was positioned on a steeply sloping fractured rock surface that exceeded 50 degrees.

PROJECT INFORMATION

Year of Completion: 2012

Construction Cost: $28M (Approx.)

Client: Proven Management Inc.



Cofferdam section

SERVICES PERFORMED

- Cofferdam Design
- Construction Engineering

The challenges encountered during the design and construction of the cofferdam required several unique design features:

- The use of flat-sheet-piles to form cellular walls on the steeply sloping rock surface.
- The use of 5-ft deep tremie concrete plugs in the bottom of each sheet pocket cell to create a bottom seal of the cellular cofferdam walls against the sloping rock surface.
- The use of vertical post-tensioned rock anchors to provide shear resistance at the contact point between the base of the cellular-wall and the sloping rock surface.

The required footprint of the cofferdam was a U-shaped structure positioned on the down-slope rock face below the dam. Conventional Z-sheet piles were selected for the offshore wall of the cofferdam that ran roughly parallel to the shore and formed the base of the U-shape of the cofferdam.

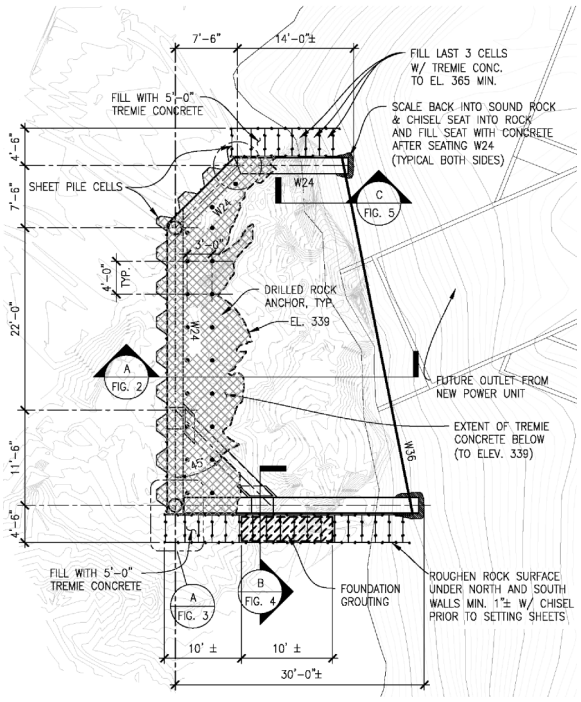
The relatively narrow flat sheets sufficiently conformed to the highly irregular steeply sloping rock surface to allow the placement of tremie concrete plugs in each cellular pocket. The purpose of the tremie concrete was to form a bottom seal between the toe of the sheet piles and the sloping irregular rock.

The three sided cofferdam was designed to resist the 32-ft hydrostatic design head at two levels. The upper support was provided by a conventional wale frame with diagonal struts positioned above water 2-ft below the top of wall. Bottom support for the offshore Z-sheet wall was provided by the 4-ft vertical surface of the tremie slab.

The tremie slab served two purposes. It cut off water flow from the offshore direction and it provided support at the bottom of the Z-sheet piles against the 32-ft hydrostatic design head of the cofferdam. The two end walls of the U-shaped cofferdam were built using flat-sheet piles configured in cellular boxes.

Aerial view of cofferdam prior to removal of rock dike

The cofferdam was successfully dewatered and remained dry during construction of the new power house and removal of the rock dike separating the downstream pool from the completed power house.



Cofferdam plan view

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BSCE 20## ## (project no.), mm-dd-yyyy (creation date)