

Howard Hanson Dam Excavation and Cofferdam Juvenile Fish Passage Facility

Eagle Gorge, Washington

Owner: USACE, Seattle District

Description: A multi-purpose project combining water supply for the south Puget Sound area with ecosystem restoration of salmon habitat above and below it, the Howard Hanson Dam includes installation of a fish passage facility (FPF) at the dam. The FPF must pass fish under extremely harsh conditions, including reservoir levels that can fluctuate over 100 feet in as little as two days due to flood water impoundment. During the peak fish passage season, the reservoir pool will slowly rise to meet the water storage summer conservation pool. The FPF is being constructed in two phases. Phase 1 included in-the-wet construction of a cofferdam and a large excavation for the foundation. Phase 2 includes installing the FPF in the excavation. For Phase 1 construction, the cofferdam was ingeniously designed to integrate into the final structure and provide seasonal maintenance dewatering capabilities for the life of the project.

After initial studies, the location of the new cofferdam was placed south of and directly adjacent to the existing outlet structure for the dam. By association with the existing outlet structure (a critical structure), the new cofferdam was also considered to be a critical structure and was designed for maximum credible earthquake (MCE) seismic events. The new cofferdam was designed to have stoplogs to withstand up to 109 feet of head from the reservoir. After in-the-wet cofferdam construction in Phase 1, rock excavation behind the cofferdam and construction of the FPF structures in Phase 2 will be completed in-the-dry.

INCA Engineers, Inc., A Tetra Tech Company (INCA) and Shannon and Wilson provided design services and prepared bid documents for new cofferdam construction and excavation for the new FPF. INCA prepared 192 engineering drawings (134 new drawings and 58 reference drawings) for Phase 1 alone. Features of the design included in-the-wet construction; large heavy-lift precast concrete components; steel stoplog, lifting beam and trashrack design for over 100 feet of head; large seismic design forces including hydrodynamic added mass; finite element modeling of the interaction of the new cofferdam structure and the existing intake tower under seismic loading; extensive rock excavation near existing structures; construction adjacent to the existing intake tower which must remain operational at all times during construction; seismic retrofit of the existing intake tower for the new conditions after construction; adapting the construction schedule to the reservoir pool elevation seasonal fluctuations; preserving the water quality of this main water source for the City of Tacoma; access roads and soldier pile walls with tiebacks; and cantilever flood and retaining walls. INCA provided engineering during construction (EDC) services.

Special Features:

- ▶ Rock excavation near existing intake tower
- ▶ Heavy lift precast cofferdam components
- ▶ In-the-wet construction
- ▶ Stoplog and lifting beam design for 100 feet of head
- ▶ Site/civil design of temporary and permanent access roads and retaining walls
- ▶ MCE seismic design including hydrodynamic effects
- ▶ Preservation of City of Tacoma water source throughout construction

Because of many technical and logistical constraints on the project and the many agencies and groups involved, the project was challenging.

The project received the SAME Large Business Gold Award and the ACEC Washington Engineering Excellence Award 2008 Silver Award for Complexity.

