

# Thunderbird Falls

By Dan Pitts



Fig. 1

**B**uilding a swimming pool on the edge of a cliff can be an exciting and challenging project, especially when using shotcrete as the main building material. Shotcrete is chosen for its strength, durability, and ability to create complex shapes, which is essential for a pool in such a unique location.

For this specific project, the pool was constructed on bedrock at the edge of a cliff in the coastal mountain range. The engineering specifications called for a double mat of 12 in. (300 mm) thick shotcrete, with footings that were 28 in. (700 mm) thick and reinforced with three layers of rebar. The grotto, an oddly shaped suspended slab, was also

constructed using a double mat of rebar. To form the roof of the grotto, panel castings were created by shotcreting into a mold made from previously created art rock. These castings were then used as part of the grotto's structure.

Due to the pool's free-form shape and its location on the side of a cliff, traditional form-and-pour concrete methods were not feasible. Instead, one-sided forms made of foam were used and left in place to provide insulation (R-value) for the above-ground walls, considering the cold Canadian winter. The use of foam as a backer form raised concerns about the heat of hydration, but careful monitoring of temperatures and continuous wet curing for ten





Fig. 2. Grotto roof and suspended slab finish.

days after the shotcrete was initially set helped mitigate these concerns.

The rockwork's rough shape was achieved by skillfully shaping the shotcrete during the shooting process. Separate shots were performed for the structural columns of the grotto with foam once again utilized as a form to expedite the construction process.

Before embarking on such a project, several important factors had to be considered. First and foremost, the structural stability of the cliff was assessed by geotechnical experts, confirming the suitability of the bedrock. Designing the pool to blend seamlessly with the surrounding landscape was crucial, with specialized shotcrete rock artists



Fig. 3. Bird's-eye views of pool on the cliff edge.



Fig. 4. Sculpted rock dry entry to grotto.

ensuring an authentic ocean rock appearance. Excavation required careful planning to avoid destabilizing the cliff, and precautions such as anchoring rebar and chains were taken to secure loose boulders.

Shotcrete, with its strength and versatility, was used to construct the pool. The combination of foam and rock castings served as the forming materials with the foam left in place to provide insulation. Steel reinforcement played a vital role, enhancing the pool's strength and stability. The grotto lid, for example, was constructed using panel castings made from molds of sculpted rock, providing both structure and aesthetic appeal.



Fig. 5. Grotto swim through with "rock" columns.

The design of the underwater portion of the pool drew inspiration from swimming experiences in gorged river spots around Squamish, BC, Canada. The shotcrete rockwork was integrated into the pool structure, saving time, materials, and labor. A skilled nozzleman's expertise was essential in shaping the rockwork to be functional, realistic, and cost-effective. Adequate reinforcing steel coverage and consolidation were prioritized to ensure strength and durability. The placement of shotcrete and the nozzleman's experience played a significant role in delivering high-quality results, which are the hallmark of Oceanrock's reputation.



**Dan Pitts** Owner/Operator of Oceanrock Art Ltd. (Oceanrock), Squamish, British Columbia, Canada. Oceanrock specializes in artisanal concrete rock environments. Everything we do is custom-designed and hand-crafted to ensure the perfect fit for your landscaping or construction project. With years of experience and top-notch concrete artists, Oceanrock is ready to build the rock environment of your dreams.

## 2022 OUTSTANDING POOL & RECREATIONAL PROJECT

*Project Name*

**Thunderbird Falls,  
British Columbia, Canada**

*Shotcrete Contractor*  
**Oceanrock Art Ltd.**

*Architect/Engineer*  
**CA Boom Engineering**

*Material Supplier/Manufacturer*  
**Cardinal Concrete**

*Equipment Manufacturer*  
**CanCrete/Putzmeister Canada**

*General Contractor*  
**Oceanrock Art Ltd.**

*Project Owner*  
**Guy & Jaime Morum**