

Highline Garibaldi Springs Rockscape Retaining Wall

By Jesse Ebenal



Fig. 1

This retaining wall was contracted for a new town-house development project in Squamish, BC, Canada. Vancouver Shotcrete & Shoring Inc. has serviced many municipalities and private companies over the past 30 years in the fields of shotcrete shoring, pools, and custom rockscapes.

The shotcrete retaining wall was designed to be anchored by Titan 40 self-drilling anchors with a test load capacity of 52,000 lbs (24,000 kg) each, spaced every 6 ft (2 m) on center. The temporary 4 in. (100 mm) shotcrete was reinforced with 4 x 4 x 1 in. (100 x 100 x 25 mm) welded wire mesh, with a 0.8 in. (20 mm) continuous whaler lining to span the load between each anchor. The engineer specified a 5800 psi (40 MPa) shotcrete mix for this purpose.

The permanent, structural shotcrete layer was designed to be reinforced with one layer of 0.6 in. (15 mm) rebar placed 12 in. (300 mm) apart, in order to span the load between anchors and bridge the joint between the temporary shotcrete and bedrock.

The shotcrete shoring contractor faced numerous challenges due to poor ground conditions, including loose rock and sand backfill, blasting of adjacent bedrock, running sands, and underground water. After excavating the slope with the approved shoring sequence, a 4 in. structurally reinforced shotcrete coat was applied against the vertical excavation and the Delta-Drain strip drainage system. This procedure was time sensitive as shotcrete had to be applied on the same day as the excavated panels. Our team



Fig. 2

experienced panels sloughing into the excavation due to the poor ground conditions and had to employ measures to fill the voids. Consequently, the base coat had many undulations, which our carving team utilized in conjunction with the finished coat to give the rockscape a more defined shape.



Fig. 3

Once the temporary shotcrete was complete, our next challenge was bending the 0.6 in. reinforcing for the 6 in. (150 mm) finished layer around the contours of the temporary shotcrete and exposed bedrock while working from manlifts. Our Rockscape crew successfully achieved these tight tolerances by using handheld hydraulic benders.

Given the nature of the shotcrete wall and the exposed bedrock, the second layer had to be applied along a narrow, in-use site access road, necessitating extensive coordination with other site trades. Subsequently, a 6 in. decorative rockscape finish was applied, hand-shaped, and carved by our in-house finishing crew. The shotcrete utilized Master-Sure Z-60 and Master fibre F-100 fibres to aid in sculpting the shotcrete.

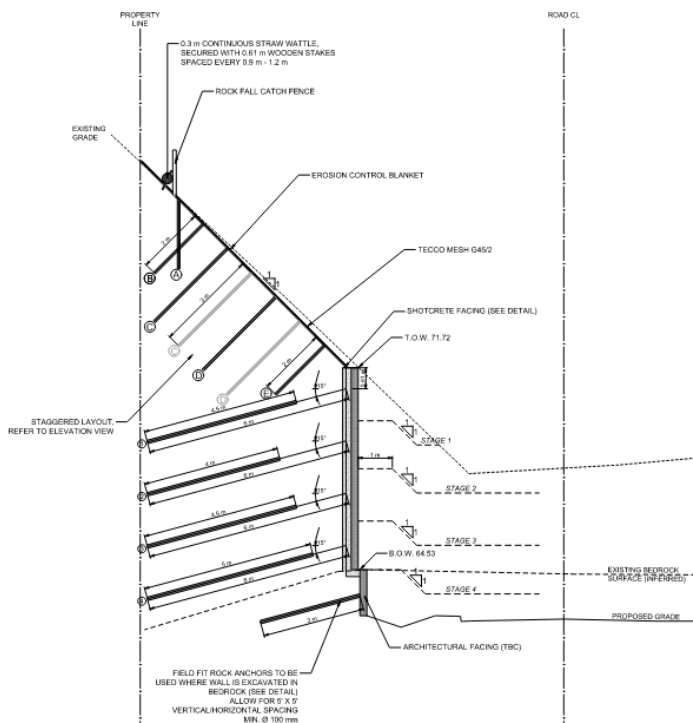


Fig. 4

PROJECT DETAILS:

- 350 ft (100 m) Rock Catchment Fence
- 500 ft (150 m) Soil and rock anchored retaining wall
- 13,000 ft² (1200 m²) Tecco Mesh and Coco Matting
- 5800 ft (1800 m) R32N Anchor Bar
- 8000 ft (2400 m) T40N Anchor Bar
- 4 in. Shotcrete - 6500 ft² (600 m²)
- 6 in. Rockscape Finish - 9200 ft² (850 m²)
- Over 450 yd³ (350 m³) of 5000 psi shotcrete

Upon reviewing the site, the engineer determined a grade difference of approximately 50 ft (15 m) along the northeast boundary of the property for the main access road of the new subdivision. This required a slope cut of 25 ft (8 m) from the property line at a 45-degree angle to the top of the retaining walls, with a maximum finished height of 25 ft. Due to the proximity to the property line, it was determined that a top-down, permanent shotcrete soil nailed system was the only viable option for the retaining wall.

Upon completion of the work, the contractor was not only satisfied with the wall's functionality but also considered it a significant aesthetic feature of the project. The client was so pleased, they chose to incorporate a 40 ft (12m) backlit landmark signage on the wall.



Fig. 5



Fig. 6



Fig. 7

2022 OUTSTANDING ARCHITECTURE | NEW CONSTRUCTION PROJECT

Project Name

**Highline Garibaldi Springs Rockscape
Retaining Wall | British Columbia, Canada**

Shotcrete Contractor

Vancouver Shotcrete and Shoring Inc.

Architect/Engineer

Fontera Geotechnical Engineers

Material Supplier/Manufacturer

Cardinal Concrete

Equipment Manufacturer

REED Concrete Pumps

General Contactor

Polygon Highland Homes Ltd.

Project Owner

Polygon Highland Homes Ltd.



Jesse Ebenal is a General Manager and has been at Vancouver Shotcrete and Shoring Inc. for 14 years. Over those 14 years, Jesse has obtained experience as a construction manager with expertise in contract negotiation, project management, and planning. His exceptional leadership and attention to detail ensure projects are

executed within budget and on schedule. With a proven track record in delivering high-quality results, Jesse is a trusted professional in the industry.