

Advancements in Train Bridge and Underpass Construction:

Architectural and Structural Shotcrete over Sheet Piles at Ross Street Underpass in Salmon Arm, BC

By Dan Pitts



Fig. 1: Aerial View of Completed Ross Street Underpass, Salmon Arm, BC, Canada.

INTRODUCTION

Salmon Arm, British Columbia, is witnessing a paradigm shift in train bridge construction with the adoption of innovative techniques such as architectural shotcrete over steel sheet piling. This method not only enhances the structural integrity and durability of the bridges but also contributes to the aesthetic appeal of the infrastructure for the Ross Street Underpass.

SHEET PILES AS FOUNDATION

Sheet piles serve as the foundation for the train bridge in Salmon Arm. These interlocking, vertical steel sheets create a robust barrier against lateral soil forces by stabilizing the ground and providing a secure base for the structure.

The choice of sheet piles in this region was influenced by the challenging geological conditions, and their versatility makes them well-suited for projects in areas with varying soil types.

ARCHITECTURAL SHOTCRETE APPLICATION

Architectural shotcrete, a process involving pneumatically spraying concrete at high velocity onto a surface, has gained prominence in bridge construction. In Salmon Arm, this technique was employed to create a protective layer over the sheet piles. The advantages of shotcrete include rapid construction, increased durability, and the ability to conform to complex shapes and designs.



Fig. 2: Sheet piles used to stabilize the Ross Street Underpass.



Fig. 3: Architectural rock finish.



Fig. 4: Architectural rock finish—additional view showcasing coloring.

This shotcrete project was a team effort between LRutt Contracting Ltd. And Ocean Rock Art Ltd. The 418 m³ (547 yd³) of shotcrete was shot over a 6-day period involving 840 m² (9000 ft²) of architectural rock finish and 2 days of colouring. Every other rib of the sheet pile shoring consisted of approximately a 24 in. (600 mm) thickness in applied shotcrete. The maximum height to the wall was 25 ft (8 m).



Fig. 5: Aerial view during construction.

The vibration of the train passing by had to be taken into consideration as there was a train every 30 minutes. This was shot in conjunction with scheduling the train and shooting areas closest to the tracks when the trains were at a slowdown zone and reducing their speeds.



Fig. 6: Train crossing over the Ross Street Underpass.



Fig. 7: A pedestrian crossing the Ross Street Underpass.

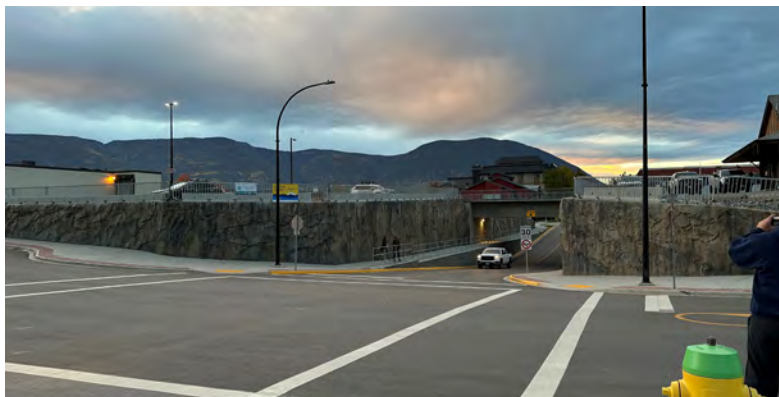


Fig. 8: Mountain view from the Ross Street Underpass.



Fig. 9: Aerial view of the completed Ross Street Underpass.

STRUCTURAL BENEFITS

The combination of sheet piles and shotcrete enhances the overall structural strength and durability of train bridges in Salmon Arm. The shotcrete layer acts as a durable shield, protecting the sheet piles from corrosion, weathering, and abrasion. This synergy ensures a prolonged lifespan for the bridge and underpass by reducing maintenance costs and increasing reliability for the transportation network.

AESTHETIC INTEGRATION

Beyond structural benefits, architectural shotcrete allows for aesthetic integration with the surrounding environment. Salmon Arm's picturesque landscape was seamlessly incorporated into the design; this ensured that the train bridge and underpass will not only serve their functional purpose but will also contribute to the visual harmony of the region. Local rock formation style, colours, and textures were applied to the shotcrete surface, and this created a unique and visually appealing infrastructure.

ENVIRONMENTAL CONSIDERATIONS

The use of architectural shotcrete over sheet piles aligns with sustainable construction practices. The efficiency of the construction process

minimizes environmental impact, and the longevity of the resulting structure reduces the need for frequent maintenance; thus, resource consumption is decreased over time.

CONCLUSION

Salmon Arm, BC is at the forefront of modernizing train bridge and underpass construction through the strategic use of architectural shotcrete over sheet piles. This innovative approach not only ensured structural resilience but also integrated aesthetics and environmental sustainability into the fabric of the region's infrastructure. As the transportation landscape continues to evolve, such advancements pave the way for safer, more durable, and more visually appealing train bridges and underpasses in the heart of British Columbia.

2023 OUTSTANDING INFRASTRUCTURE PROJECT

Project
Ross Street Underpass

Project Location
Salmon Arm, BC, Canada

Shotcrete Contractor
**Ocean Rock Art Ltd
LRutt Contracting Ltd**

Materials Supplier
Salmon Arm Ready Mix

General Contractor
Kingston Construction

Owner
City of Salmon Arm, BC



Dan Pitts is President of Ocean Rock Art Ltd. and Partner in Ocean Rock Art US LLC. He is a Certified ACI nozzleman and proudly serves as a corporate member of the American Shotcrete Association. Ocean Rock Art's work has garnered widespread recognition, earning them multiple accolades. Dan Pitts' innovative approach to blending nature with design sets him apart as a true luminary in the field of shotcrete rock art, leaving an enduring mark on the landscape of contemporary architecture.