

Lake Country Wine Tunnels

By James Marifosque and Roger W. Abbott

Lake Country is a municipality located in the Central Okanagan Valley of British Columbia, Canada, which is approximately 250 miles (400 km) northeast of Vancouver. Home to British Columbia's Wine Country, Lake Country offers tourists many activities including watersports, camping, hiking, golf, and ski resorts.

Thanks to the unique weather and soil conditions present in the Okanagan Valley, many wineries and vineyards are situated around the region. Among the many wineries, the O'Rourke Family Vineyards stands out as one of the first to implement a tunnel system below the bedrock to house its wines (Fig. 1).

The tunnels are situated on a 200-acre (0.8 km²) lot overlooking the water comprising approximately 1000 ft (300 m) of tunnel with four portals, and will be one of the highlights of the location. The first of its kind in Canada, it will be able to house countless barrels and bottles of wine, and people will be able to walk through and enjoy the sights. Storing the wine in this natural area will provide the perfect temperature of around 59 to 61°F (15 to 16°C) throughout the year, along with the perfect humidity (Fig. 2).

Other planned attractions to the winery include a separate ballroom, concert area, and a library housed in the tunnels. Opening date is set for 2018.

CHALLENGES

Abbott Shoring, based out of Vancouver and Penticton, BC, Canada, has provided over 35 years of rock stabilization, drilling, anchoring, shoring, and shotcreting services. Abbott was called in after the tunnels were dug to provide structural overhead shotcrete.

When Abbott arrived on site, the tunnels were already mined. Originally, shotcrete was not part of the plan as the owner wanted a natural rock look, so no consideration was made for shotcrete, only using welded wire mesh, rock bolting, and Tecco mesh for support. However, over time, due to the fractured nature of the rock, raveling was occurring behind the welded wire mesh, requiring de-bagging of the trapped rock fragments. It was felt that without shotcrete support, this could be a costly ongoing maintenance problem, and therefore, the decision was made from a cost and

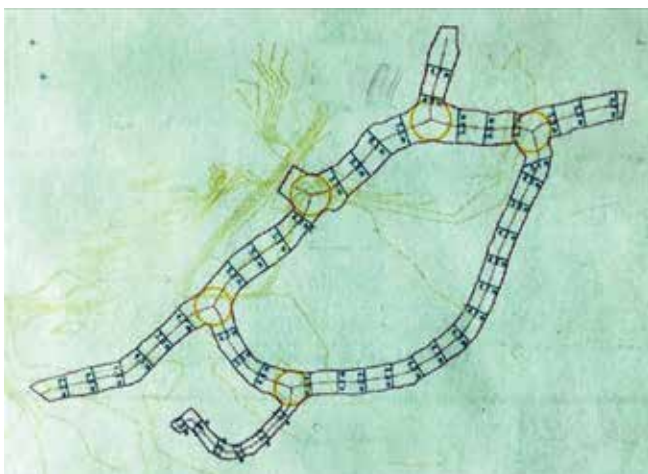


Fig. 1: Tunnel layout



Fig. 2: Main tunnel



Fig. 3: Tunnel prior to shotcrete

safety perspective to totally enclose the tunnel surfaces with shotcrete. The overhead areas where raveling had occurred were scaled and secured tightly to receive shotcrete without movement or vibration. Where major slips had shown movement and removal of the large blocks of rock could cause further instability, grout tubes were shot in and subsequently grouted once shotcrete had attained 28-day strength (Fig. 3).

Working in confined spaces, as well as having no radio service in the tunnels, provided interesting challenges for the coordination of the shooting over the 1000 ft (300 m) of tunnel. As the shotcrete equipment had to be stationed



Fig. 4: Tunnel portal

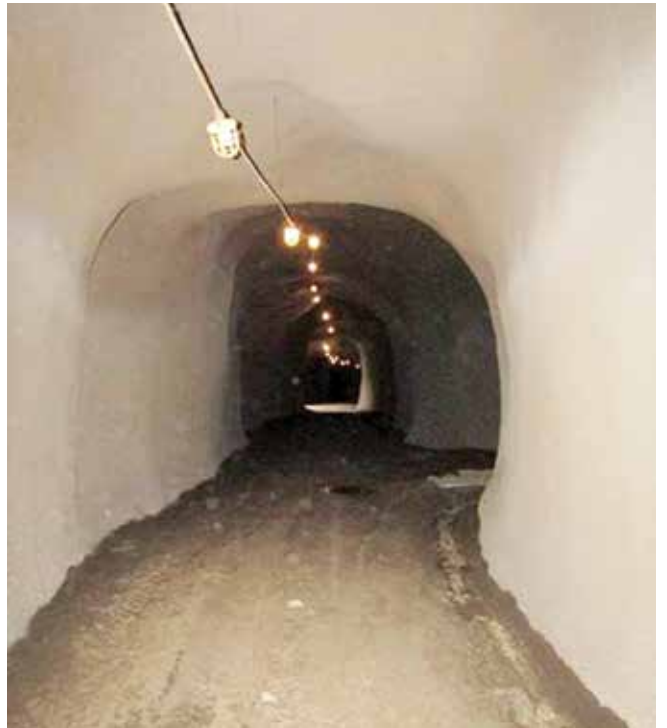


Fig. 5: Completed tunnels

outside the tunnel (Fig. 4), traditional hand signals with a few personnel stationed between the gun and the nozzle were used.

Also, because there was a lot of construction happening above the tunnels, care had to be taken to coordinate shooting of the shotcrete with the construction above to reduce vibration and to aid in the set of material.

The shotcrete nozzlemen were all ACI-certified for vertical and overhead dry-mix shotcrete.

SHOTCRETE MATERIALS

Overall, shotcrete provided a superior, aesthetically pleasing, long-term solution for the Lake Country Wine Tunnels (Fig. 5). Using quality materials from Basalite—fine tuned to the specific needs of the project along with an experienced shotcrete contractor with ACI Certified Nozzlemen—created a wine cave system to store the vineyard’s precious products in an optimum climate and complete safety with reduced maintenance.

Basalite Concrete Products provided the dry-mix shotcrete, which included steel fibers and accelerator, to aid in the overhead structural shooting. Most of this was used for shooting overhead, and a small amount was used for sculpting around the portals. The steel fibers were essential to the structural overhead component of the work, while the accelerator allowed for the quick set of the shotcrete. A silica fume-enhanced mixture was chosen to help with stickiness in shooting overhead, as well as to increase strength and reduce permeability. Shotcrete was placed in thicknesses varying from a skim coat to 6 in. (150 mm) and covered around 39,000 ft² (3600 m²). A total of 456 yd³ (349 m³) was shot, which included shotcrete with and without fibers and with and without accelerator.



James Marifosque, EIT, is the Industrial Sales Engineer for Basalite Concrete Products, ULC, for the Canadian operation. He graduated from the University of British Columbia, Vancouver, BC, Canada, in 2012 with a Bachelor of Applied Science in civil engineering. He has worked in infrastructure and heavy civil construction, specializing in quality management and materials engineering and testing. This includes concrete, shotcrete, asphalt, and soils. Currently, he is involved with the industrial sales and business development of dry-mix products for Basalite in Western Canada, including British Columbia, Alberta, and Saskatchewan.



Roger W. Abbott is President of Abbott Shoring & Foundations Ltd., whose main focus is shotcrete shoring and underpinning, seismic structural reinforcing, and rock and slope stabilization, in both dry and wet applications. He resides in North Vancouver and has over 40 years of experience with both temporary and permanent shotcrete applications in Canada.

2017 HONORABLE MENTION

Project Name

Lake Country Wine Tunnels

Project Location

Lake Country, BC, Canada

Shotcrete Contractor

Abbott Shoring & Foundations

General Contractor

Sureway Construction

Architect/Engineer

Geowest Engineering

Material Supplier/Manufacturer

Basalite Concrete Products*

Project Owner

O'Rourke Family Vineyards

*Corporate Member of the American Shotcrete Association