Delicate blasting on Highway 99

By Tonia Jurbin

The natural internal fractures of the rock necessitated controlled blasting techniques.

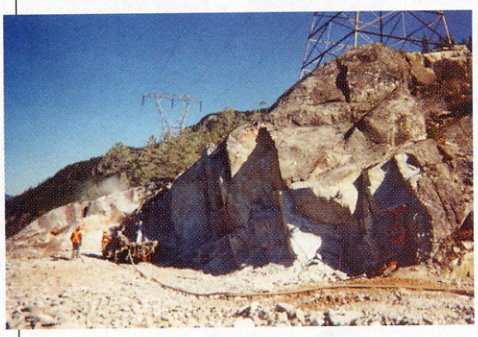
Like a project destined to be a textbook example of everything that could happen, the improvements on a seven-km stretch of the infamous Squamish Highway, have been stalled by flooding, fire, snowstorms and traffic. Now, with the 2010 Winter Olympics on the horizon, the heat is on to finish the work.

The $18.3-million general contract for spanning the Cheakamus Canyon, about 20 km south of Squamish, was awarded to Bel Pacific Excavating and Shoring of Burnaby, B.C. It includes widening the highway to three lanes, improving poor alignment and grades in the existing road, and repaving.

The work was carried out over two windows to accommodate the ski season.

One of the more interesting and substantial subcontracts was the removal of some 275,000 m^3 of rock. This contract, worth about $4.5 million, was awarded to Pacific Blasting and Demolition of Burnaby, B.C. The blasting contract includes all the drilling and blasting, rock bolting, meshing and shotcrete work required. The work is being carried out over two windows to accommodate the busy ski season — May to November 2003, and March to July 2004.

Because of the orientation of the natural internal fractures of the massive rock, controlled blasting techniques had to be used. Careless rock-slope blasting can damage the rock mass far beyond the boundaries of the project by unnecessarily opening the fractures with blast pressures, allowing more water to enter the cracks over time, increasing the



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severity of freeze thaw cycles, or increasing the occurrences of root jacking as vegetation grows in the ever wider spaces.

"Wall-control" blasting, or "smooth-wall" blasting methods were used on this job. The blast is designed to just crack the rock along the back wall — without breaking it — milliseconds before the rest of the rock is blasted.

"On this job there were no utilities to worry about with the exception of the B.C. Hydro towers, where we had to keep our peak particle velocities under 4 in./sec. There were three that were close, and one that was only about 18 m from our nearest blast hole," explains Wayne Verwey, blasting superintendent for Pacific Blasting.

These circa-1945 tower legs are set on concrete pads that are anchored into the rock. The concerns for B.C. Hydro were several: past experience with development has meant expensive repairs when blasting velocities exceeded the limits, causing failure in the rock and weakening the rock/grout/anchor bonds. Other concerns included excessive vibrations that could loosen bolts in the aging tower, vibration that could be induced in the conductors causing damage at the clamping mechanisms and that flyrock could slice through the conductors like a hot knife through butter.

If that were not enough, blasting mats — big tire nets — could not be placed over the blast areas to catch flyrock. Verwey explains, "Because of the Hydro lines, we had to use non-electric blasting systems which don't lend themselves well to using blasting mats. The plastic tubing required for non-electric blasting can be easily damaged by the weight of the mats, resulting in misfired holes. Only about three or four blasts were matted. The steep terrain made it almost impossible to get the 5,000 lb. mats to the blast site."

BC Hydro's assets were protected by using solid blast design methods, followed by test blasts in less-sensitive areas.

Verwey continues, "There were many challenges on this job: most difficult was blasting at night, because it's pitch black up there which makes it hard to inspect the work. In the summer there is no wind in this canyon, so the dust resulting from the blast could take one half to one hour to dissipate and the crews have to wear respirators during this time. During the extreme fires we had to shut down for about two weeks, and six weeks later we had the massive floods which caused part of our resources to be diverted to emergency road reinstatement. Shortly after that we were shut down because of snow storms, and the traffic on this highway is always a concern, especially during the daily commute to Whistler from Squamish."

Despite these tribulations, so far the blasting project has been a success and the Hydro towers remain intact. ◆

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