

## AVALANCHE TERRITORY

**In the mountains of B. C., avalanche expert Alan Jones works with geotechnical engineers and designers to keep the roads free of deadly snow falls.**

**By Heather Kent**

For avalanche engineers like Alan Jones, P. Eng., British Columbia's Coquihalla Highway represents the Holy Grail of avalanche design work. Opened in time for Expo '86, the highway goes through "some pretty impressive avalanche terrain," says Jones. He credits Peter Shaerer, P. Eng. --"the grandfather of avalanche work in Canada" --for his work in identifying the avalanche hazards and helping decide on the route. Shaerer also recommended mitigating measures such as an above-surface snow-shed (a protective concrete roof over the highway) and earth-filled deflection berms. With the notable exception of a massive snowfall in the winter of 2007 that closed the Coquihalla route for eight days, few avalanches have caused major disruptions on the highway.

Jones is an associate with Chris Stethem & Associates in Revelstoke, B. C. He is one of a handful of engineers in the province currently specializing in the mitigation of avalanche hazards for various types of projects, including highways.

Jones began his career as a geotechnical engineer before moving to the Ministry of Transportation and Infrastructure's snow avalanche program in Stewart, B. C. He also completed a master's degree in avalanche mechanics at the University of Calgary, and worked at the Canadian Avalanche Centre for three years, managing a team of avalanche forecasters. Now, as a consultant, Jones spends some of his time integrating his skills in avalanche risk prevention with work on locating and designing roads and facilities. He works with clients as varied as the B. C. Ministry of Transportation and Infrastructure, private run-of-river hydroelectricity companies, and ski resort developers.

### **Sizing up the problem**

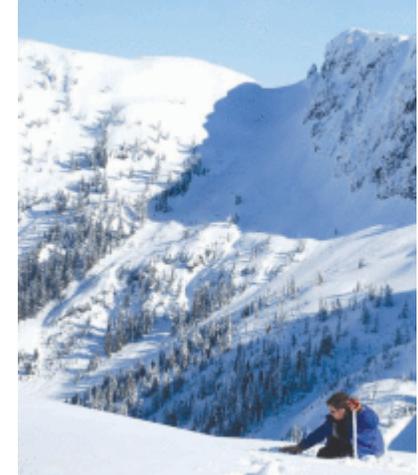
Avalanche forecasting involves looking at how snow, rain, wind and air temperature interact with the snow pack. The relationship between these variables is complicated, and the underlying causes of avalanches are still only moderately well understood. To help with these forecasts, Ministry of Transportation and Infrastructure staff obtain weather data from electronic stations monitoring 60 avalanche prone areas throughout the province.

The B. C. Ministry has set a threshold for determining their preventive program, Jones explains. If an avalanche big enough to bury a vehicle is expected to occur at a location along the highway more frequently than every 30 years, then the Ministry will activate mitigation measures such as temporary road closures, explosive controls, and sometimes structural defences.

One of the most common methods of avalanche control for highways is carried out by launching explosives from helicopters. The Ministry has also recently begun using fixed, remotely fired GazEx exploders placed at Kootenay Pass on Highway 3, near the U. S. border.

"This is a place where they put the highway on the wrong side of the valley with respect to avalanche hazards and we have had to live with the repercussions ever since," says

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Jones. The exploder technology can be used to set off controlled avalanches during weather conditions when helicopter flying may not be possible.

### **Prevent a landslide; create an avalanche**

Recently Jones has been collaborating more closely with geotechnical engineers in dealing with combined landslide and avalanche risks: “This collaboration was rarely done in the past,” he says. Engineers designing a new road will often cut a new slope above the road at around 35 degrees in order to mitigate the chances of a landslide impacting the road, but in doing so they may inadvertently create ideal conditions for creating avalanches, Jones explains.

With this clear overlap in their work, Jones’ cooperation with geotechnical engineers makes sense. For example, on the Kicking Horse Canyon section of the Trans Canada Highway, Jones is working in the same area with geotechnical engineers on rockfall hazards and the potential for avalanche risks, as well as on the future alignment of new construction.

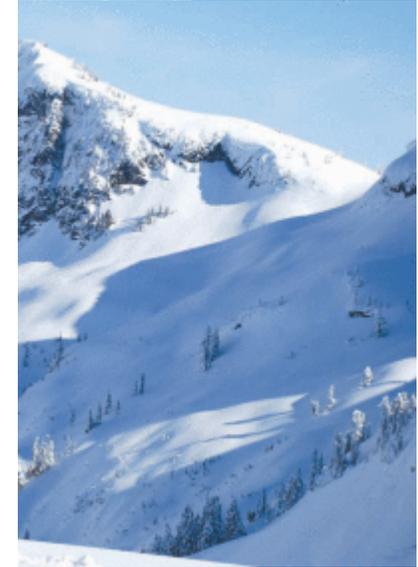
Two years ago, he provided input into the design of a 7.5 metre high wall to prevent avalanches and rockfalls reaching the road west of the Yoho River. The goal, says Jones, was to provide a permanent mitigating solution, which is all part of a recent trend towards building engineered structures to allow the Ministry of Transportation to phase out an active monitoring program on this section of the highway. While geotechnical engineers predicted the potential impact pressures of rock falling on the wall, Jones determined the potential effect of an avalanche on the structure. “Avalanches were the determining factor on the strength of the wall. Even though rocks are denser, avalanches come out at quite a high speed,” he explains, adding that the estimated speed of the design avalanche was over 60 km/hr.

In another project Alan worked on, potential new avalanche terrain was created at Springer Creek, near New Denver. “This is one of the interesting parts of this work,” says Jones. “Conditions change all the time and new avalanche terrain is created every now and then.” A 3,000-hectare fire in 2007 stripped the Springer Creek area of avalanche-preventing forest. Jones was hired to investigate the potential for avalanches to impact the highway, and he recommended future monitoring. The following spring, the combination of spring runoff and unstable ground contributed to a mud slide 9 metres deep on the highway. The debris field cut off Highway 6 and killed one person. But avalanches have not reached the road, and the Ministry of Transportation will monitor this area in the future.

Future highway construction in Canada will incorporate improved planning and alignment with more engineered, fixed structures, Jones predicts. He refers again to the work of Peter Shaerer on the Coquihalla Highway with its snowshed and berms. “He did such a good job with the design,” he says.

*Heather Kent is a writer on the environment, based in West Vancouver.*

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Jones making snowpack observations near Powell River on the west coast of B. C.

*Photos by Kevin Fogolin, Alan Jones, Chris Stethem Assoc.*

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Forest destroyed by a large, wet avalanche in a gully near Campbell River in the Coast Mountain Range.