

Avalanche technician Peter Marshall of Alpine Solutions Avalanche Services analyzes snow stratigraphy on the slopes north of Pemberton, B.C.

A route to reducing avalanche risks

By Helena Bryan

Last year, Terri Wolfe witnessed Mother Nature at her most breathtaking — and her most terrifying. Wolfe was riding in a Ford pickup through B.C.'s Rocky Mountains when an avalanche struck. "It was amazing and sobering to see it roar down the mountainside," she recalls.

As president of mining company John Wolfe Construction Co., Wolfe wasn't on a sightseeing tour on Mount Brussilof in the middle of the Rockies. Rather, she'd been briefed to expect an avalanche that day. Dynamic Avalanche Consulting Ltd., the company she'd hired to do an avalanche risk assessment and

safety plan for the mine's access road, had invited her for a first-hand look at avalanche control.

As Wolfe has discovered, triggering a slide with explosives can be standard practice for avalanche experts. The idea is to trigger an avalanche on an unstable and deserted slope to avoid a slide occurring when people are actually working in the area.

And while avalanche preparedness needn't be as complex for every workplace, such measures are worth the cost to Wolfe. She is responsible for the safety of more than 40 employees and independent contractors who must travel through avalanche-prone terrain to get to and from the mine.

“When I weighed the costs against the benefits it was simple: I’d much rather be safe than sorry.”

—**Terri Wolfe**, president of John Wolfe Construction Co. in Radium Hot Springs, B.C.

“We have a bus that brings employees in. It’s an hour on forest service roads, 38 kilometres off the highway,” Wolfe explains. “We drive across three or four avalanche slide paths on the way. We’ve had avalanches in the past that haven’t hurt anybody, but they’ve come down as far as the road, which we use every day to haul rocks from the mine for processing.”

Worker, employer stakes are high

B.C. is full of such rugged terrain. And working in it without proper precautions is dangerous, even deadly. From 1999 to 2008, 29 workers in B.C. were either injured or killed by avalanches, or, in some cases, landslides. While almost half of these workers worked for ski resorts or backcountry ski operations, the surprising fact is that the other half worked in fields not commonly associated with avalanche risks: forestry, oil and gas pipeline construction, highway maintenance, and mining.

These statistics — and the fact that many employers outside the ski hill industry overlook their vulnerability to avalanches — are part of the reason why WorkSafeBC introduced a new section to the Occupational Health and Safety Regulation (the Regulation) on avalanche evaluation, risk assessment, and safety planning. Section 4.1.1 requires all employers whose workers travel through, work around, or within an avalanche hazard zone to conduct an evaluation to determine if there is a risk from an avalanche. If the employer determines that a risk exists, the employer must conduct a risk assessment and develop and implement an avalanche safety plan and program to either eliminate or minimize workers’ exposure to the avalanche risk.

However, both the avalanche risk assessment and safety plan and program deemed appropriate for each employer very much depends on the degree of risk and level of worker exposure to avalanches, says Kelowna-based occupational safety officer Kevin Birnie.

“We recognize you can’t always eliminate the risk,” Birnie says. “But if your workers are at risk, the Regulation expects that you’re going to mitigate those risks to the lowest level possible. The way to mitigate those risks is through the development and implementation of an avalanche safety plan, safe work procedures, and worker training specific to avalanches.”

Are you at risk? The answer might surprise you

WorkSafeBC forestry industry specialist Carole Savage, a member of the Canadian Avalanche Association, says one of the biggest misconceptions employers might have regarding avalanches is to assume they are working in safe terrain.

“We often don’t know what we don’t know,” she says. “Without the proper training and experience, people often do not realize they are at risk from avalanches.”

Joe Obad, executive director of the Canadian Avalanche Association, says employers often assume avalanches only happen in winter. “Defining the beginning and end of avalanche season may also require a qualified person,” he says. Obad cites a worker who died in an avalanche in 2012 in conditions not typically associated with winter or avalanche season. “The late winter or spring presents its own challenges, where the snowpack may lock up overnight but release huge slides on warming. These periods call for additional expertise.”

Savage, a registered professional forester and avalanche safety instructor, says the signs of a worksite avalanche risk can be subtle. “And that’s why it’s important to seek out someone qualified to determine if such a risk exists, and if it does, to help you develop a risk assessment and avalanche safety plan or program.”

Revised avalanche regulations in effect

Until recently, employers were still finding it challenging to minimize avalanche risks according to section 4.1.1 requirements. This was because it was difficult to find qualified people — previously defined by the Regulation as having professional accreditation or certification — to meet the demand for avalanche risk assessment and safety plan development.

On February 1, 2015, after several years of consultation with industry stakeholders and the general public, WorkSafeBC revised the criteria associated with the hiring of an avalanche professional to help meet the avalanche risk requirements, including the addition of Regulation section 4.1.2. This has changed the requirements and expectations for individuals conducting avalanche risk assessments and developing avalanche safety plans and programs.

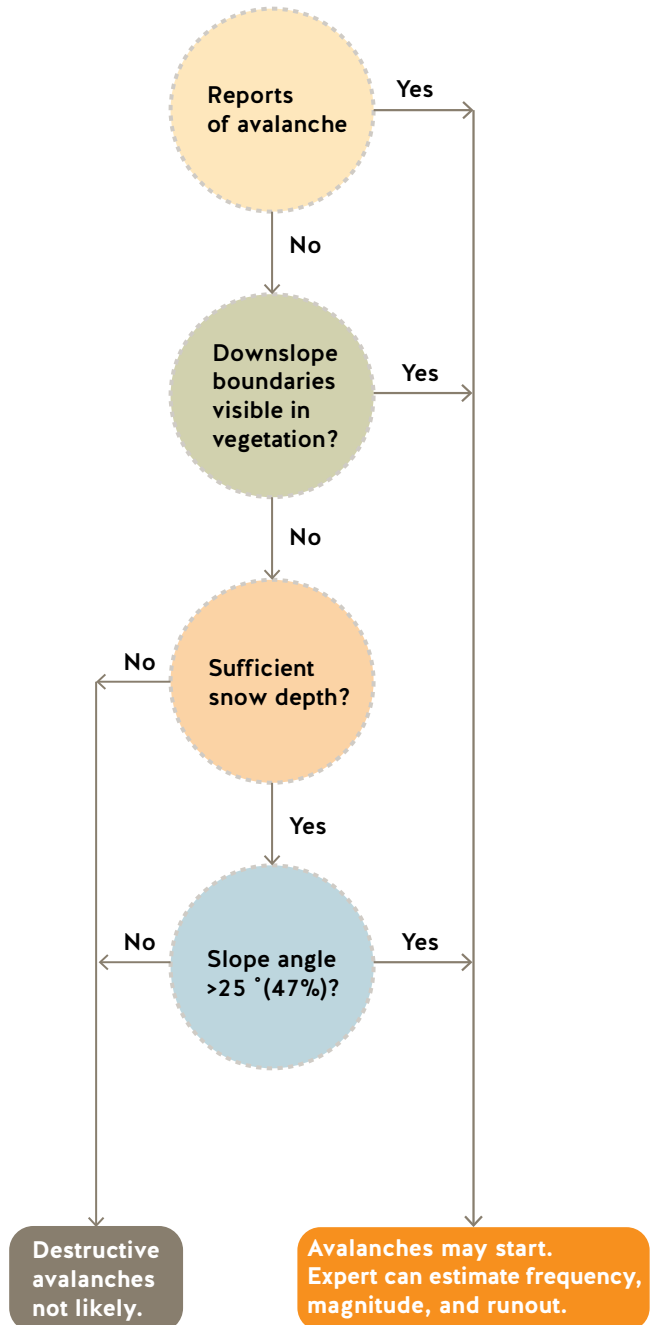
Specifically, the new threshold enables a “qualified person” to conduct the avalanche risk assessment and develop the avalanche safety plan. The definition of a qualified person is anyone with knowledge of the work and the hazards involved, and the education, training, and experience to provide qualified input on avalanche risk assessment and planning. (More information on these requirements can be found in the Occupational Health and Safety Guideline 4.1.1, available on worksafebc.com.)

“Avalanche hazards and risks are variegated,” says Cranbrook-based WorkSafeBC occupational safety officer Tim Birkett. “How detailed that initial risk assessment should be depends on a number of factors.

“A qualified person might find that your employees’ exposure is intermittent, which might include large geographical terrains. This person may prescribe specific training and detailed safe work procedures. If there’s minimal potential that work will trigger an avalanche, it’s not practicable for the employer to do a detailed risk assessment involving extensive and detailed reconnaissance of the terrain or of work during emergency conditions.”

Brian Gould, senior avalanche specialist for Alpine Solutions Avalanche Services, says employers have a way of mapping quickly and cost-effectively using the Avalanche Terrain Exposure Scale, known as ATES. His company has used this method in working for the

Recognizing the potential for an avalanche hazard



— Adapted with permission from page 6 of the Canadian Avalanche Association’s (CAA) Land Managers Guide to Snow Avalanche Hazards in Canada. Available at www.avalancheassociation.ca. (The CAA will publish updated guidelines for land managers and avalanche practitioners in early 2016.)



Ryan Shelley, an avalanche technician for Alpine Solutions Avalanche Services, outlines proper use of an avalanche probe to a First Nations group working in remote mountain terrain on the Prince Rupert Gas Transmission LNG pipeline project.

pipeline industry to map avalanche terrain comprising up to 800 square kilometres.

A safety plan customized for the risks

Simple or complex, avalanche safety plans must be written by a qualified person, Birkett says. And more detailed risk assessments may require more unique skills.

“Smaller companies might want to think about hiring someone in-house with the right training and experience to be that qualified person. That way, the costs of avalanche safety planning and management are embedded. The qualifications you’ll need will depend on the industry, the type of work you’re involved in, and the complexity of the plan.”

John Wolfe Construction in Radium Hot Springs, B.C., has a flexible avalanche safety plan, designed to be responsive to varying winter weather conditions. Dynamic Avalanche Consulting Ltd. developed a plan for John Wolfe after mapping the area and identifying

avalanche paths requiring regular monitoring. “It can be rigorous when conditions dictate, but in some years there will be minimal monitoring,” says Jeff Volp, avalanche technician for Dynamic in Kimberley, B.C.

“If there is stationary work occurring in avalanche areas, the risk is much greater. When conditions create an elevated risk, we regularly monitor the avalanche hazard and conduct mitigation work, such as explosive avalanche control, and we implement worksite restrictions as required. This flexibility keeps the costs lower for the client by not requiring active, frequent monitoring when the risk is low.”

Snow stability can change daily but also by the hour or by the minute; and avalanches can occur any time the terrain offers sufficient snow depth and the right weather conditions and snowpack characteristics. So, as part of John Wolfe’s safety plan, Dynamic monitors nearby weather and snowpack conditions and evaluates the avalanche risk to workers as conditions

warrant it. That monitoring resulted in several planned avalanches last winter.

“Yes, there’s some cost to all this,” Wolfe says. “But when I weighed the costs against the benefits, it was simple: I’d much rather be safe than sorry.”

For more information on avalanche safety resources and services for your workplace, visit the Canadian Avalanche Association website at

www.avalancheassociation.ca.

To find a list of association safety service providers, look under the Resources tab for “Avalanche Safety Services,” or go directly to www.avalancheassociation.ca/search/custom.asp?id=3102. For information on the avalanche safety regulations, look under “OHS Regulation” under “Quick Links” at worksafebc.com.

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Avalanche hazard management: a hierarchy of controls

Mark Harper, a WorkSafeBC occupational safety officer based in Kamloops, says employers should apply the following hierarchy of controls to manage avalanche hazards at their workplaces:

- 1 Administrative control** — Plan the work to include closures or other ways to avoid the avalanche hazard by working in areas where the hazards are non-existent or very low because of meteorological or seasonal conditions.
- 2 Engineering control** — use barriers, guards, diverters, etc., to manage avalanche risks to people and infrastructure, such as the snow sheds erected on the Coquihalla or Rogers Pass highways.
- 3 Avalanche control** — actively manage avalanche hazards through the use of explosive bombing, blasting, or shelling systems to produce avalanches under controlled conditions.
- 4 Procedural control** — implement safety procedures when the above-mentioned controls are not practicable because of the type and nature of work to be conducted. Procedural controls rely primarily on worker training, experience, equipment, and safe work procedures.

These controls are not mutually exclusive, Harper says, and may be used in conjunction with one another as part of the employer’s avalanche safety plan or program.

The pros and cons of avalanche airbags

In 2007, when five people skiing in northwestern B.C. were caught in an avalanche, and two of them died, the B.C. Coroner's Office conducted an accident investigation to try to get to the bottom of the tragedy — and avoid future deaths on B.C.'s mountains.

As it turned out, the ski guide involved in the avalanche was wearing an avalanche airbag, designed to keep the wearer on top of a moving slab of snow, instead of buried beneath it. Fortunately, the guide ended up on top of the debris when the avalanche stopped, and was able to dig himself out. He then went on to immediately assist with the rescue that saved the lives of two buried avalanche victims. The two skiers in the group who died weren't wearing airbags.

Following those events, the Canadian Avalanche Association and Pascal Haegeli, now research chair



A study on the use of avalanche airbags deemed them effective protection in a worst-case scenario.



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“The best safety tactic is still to avoid being in an avalanche in the first place.”

—**Pascal Haegeli**, research chair for Avalanche Risk Management at Simon Fraser University

for Avalanche Risk Management at Simon Fraser University, submitted a successful proposal through the Innovation at Work funding stream from WorkSafeBC's Research Services. The study, completed in 2012, was aimed at providing a thorough analysis of the pros and cons of using avalanche airbags in Canada. Previous studies had focused on the European context, where conditions could be different.

“At the time, there was considerable debate among the avalanche safety community about the effectiveness of airbags, but little solid evidence,” Haegeli says.

Here are the study's main findings regarding the use of avalanche airbags. (Note that the following findings come from a more recent, international study, available at www.resuscitationjournal.com/article/

[S0300-9572\(14\)00566-8/abstract](http://S0300-9572(14)00566-8/abstract); for the original WorkSafeBC-funded study, see www.worksafebc.com/contact_us/research/research_results/res_60_10_1350.asp):

- Avalanche airbags are valuable, but survival is not guaranteed.
- Airbags reduce the risk of dying in an avalanche from 22 percent to 11 percent.
- Non-inflation — mostly due to the wearer not deploying the airbags — considerably limits their effectiveness. Training on the use and maintenance of balloon packs is, therefore, critical.
- The benefits of airbags are quickly nullified if the wearer uses them to justify taking larger risks in avalanche terrain.

“Avalanche airbags are not a replacement for the standard safety equipment — transceiver, shovel, and probe — that everybody travelling in avalanche terrain should carry,” Haegeli says.

“Personal protective equipment can be beneficial, but the best safety tactic is still to avoid being in an avalanche in the first place.” ☺



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