The Rutschblock Test

by Cam Campbell

Site selection

Above all, test sites need to be safe, which means at the top of small slopes with no terrain traps. They need to be representative of the avalanche terrain under consideration (i.e. to gain information about a wind-loaded slope, find a safe and undisturbed part of a similarly loaded slope for the test). They also need to be undisturbed (i.e. the site should not contain buried ski tracks, avalanche deposits, etc., or be within about 5 m of trees where buried layers might have been disturbed by clumps of snow that have fallen from branches). Rutschblocks need to be performed on slopes that are at least 25 degrees, or at least as steep as a flight of stairs.

Procedure

The Canadian Avalanche Association's Observation Guidelines and Recording Standards for Weather, Snowpack and Avalanches (CAA, 2007) recommends the following procedure:

- Mark width of the block and length of the side cuts on the surface of the snow with a ski, ruler, etc. The block should be 2 m wide throughout if the sides of the block are to be dug with a shovel. However, if the side walls are to be cut with a ski, pole, cord or saw, the lower wall should be about 2.1 m across and the top of the side cuts should be about 1.9 m apart (Figure 1). This flaring of the block ensures it is free to slide without binding at the sides. The side cuts should extend 1.5 m up the slope.
- The lower wall should be a smooth vertical surface cut with a shovel. Dig or cut the side walls and the upper wall deeper than any weak layers that may be active. If the side walls are exposed by shoveling, then one rutschblock test may require 20 minutes or more for two people to perform.
- If the weak layers of interest are within 60 cm of the surface, save time by cutting both the sides and upper wall of the block with a ski pole (basket removed) or with the tail of a ski. If weak layers are deeper than 60 cm and the overlying snow does not contain any knife-hard crusts, both the sides and upper wall of the block can be sawed with cord which travels up one side, around ski poles or probes placed at both upper corners of the block and down the other side.
- Once completely isolated from the surrounding snowpack, the block is progressively loaded by a person on skis or snowboard according to Table 1.

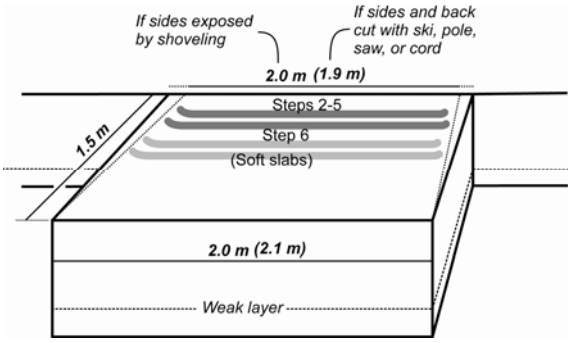

Figure 1 - Rutschblock tester positions and dimensions for a block with the sides exposed by shoveling or cut with a saw, cord, ski or pole in parenthesis (CAA, 2007).

Table 1 – Rutschblock test loading steps (CAA, 2007).

Rutschblock score	Loading step that produces a clean shear fracture
1	The block slides during digging or cutting, or anytime before the block is completely isolated.
2	The tester approaches the block from above and gently steps down onto the upper part of the block (within 35 cm of the upper wall).
3	Without lifting heels, the tester drops from straight leg to bent knee position, pushing downwards and compacting surface layers.
4	The tester jumps up and lands in the same compacted spot.
5	The tester jumps again onto the same compacted spot.

6	For hard or deep slabs, remove skis or snowboard and jump on the same spot. For soft slabs or thin slabs where jumping without skis might penetrate through the slab, keep equipment on, step down another 35 cm (almost to mid-block) and push once then jump three times.
7	None of the loading steps produced a smooth slope-parallel fracture.

Interpretation

Figure 2 shows that as rutschblock score increases, the likelihood of skier-triggering the same slope decreases. These data were collected by performing rutschblock tests at representative sites on slopes that were skier-tested. The good news is that 100% of the slopes with a rutschblock score of 1 were skier-triggered; the bad news is that 10% of the slopes with rutschblock score of 7 were skier-triggered. This is bad news because these false-stable results could potentially get us into trouble. If the rutschblock test was perfect, none of the slopes with a rutschblock score of 7 would be skier-triggered. Furthermore, even on seemingly uniform slopes rutschblock scores can vary significantly within a few metres.

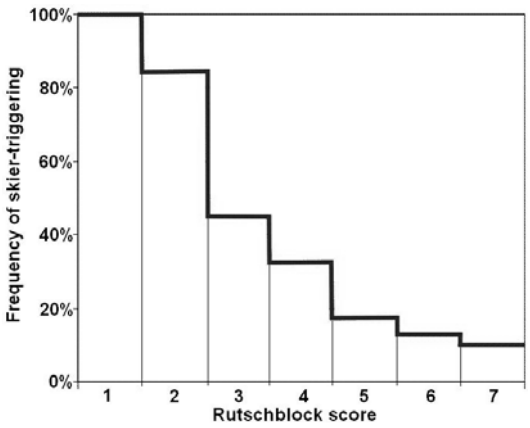

Figure 2 – Frequency of skier-triggering versus rutschblock score on slopes that were ski tested. (Applied Snow and Avalanche Research, University of Calgary data)

One potential way to reduce the uncertainty associated with rutschblock tests is to incorporate release type observations (Table 2) into test results. The proportion of the block that fails, whether it's the whole block, most of the block or only an edge, is less variable than the rutschblock score (Campbell, 2004) and may provide information about fracture propagation propensity. For example, a rutschblock score of 6 where only the edge of the block releases can be interpreted with more certainty than a rutschblock score of 6 where the whole block releases.

Table 2 – Rutschblock release type (CAA, 2007)

Release type	Description
Whole block	90 - 100% of block.
Most of block	50 - 80% of block.
Edge of block	10 - 40% of block releases on a planar surface.

References

Campbell, C. 2004. Spatial variability of slab stability and fracture properties in avalanche start zones. MSc thesis. Dept. of Civil Engineering, University of Calgary, Calgary, Alberta, Canada.

Canadian Avalanche Association (CAA). 2007. *Observation guidelines and recording standards for weather, snowpack and avalanches*. Canadian Avalanche Association, Revalstoke, BC, Canada.