How To: The Propagation Saw Test (PST)

Dave Gauthier, Cameron Ross, Bruce Jamieson – October 2008

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OBJECTIVE: The objective of the PST is to test the propagation propensity of a specific weak layer and slab combination independently of any loading required for fracture initiation. The PST can be applied to a slab/weak layer combination ranging from 30 cm to over 250 cm deep and is therefore capable of testing slabs in the skier-triggerable range as well as much deeper slabs.

SITE SELECTION: Although it is important to select an aspect and snowpack representative of the start zone/ski slopes of concern, the PST has been shown to work successfully on flat and shallow slopes, and since it is independent of surface loading it is capable of indicating propagation propensity in deep layers.

EQUIPMENT: The PST requires a shovel, two probes, a Rutschblock cord (4-7mm cord with knots every 20-30cm), and a snow saw that is at least 35cm long. A ruler is easier than a graduated probe for measuring column dimensions and saw cut lengths, and a small brush or crystal screen can help identify the weak layer in the snowpack.

PST PROCEDURE:

STEP 1: identify the weak layer

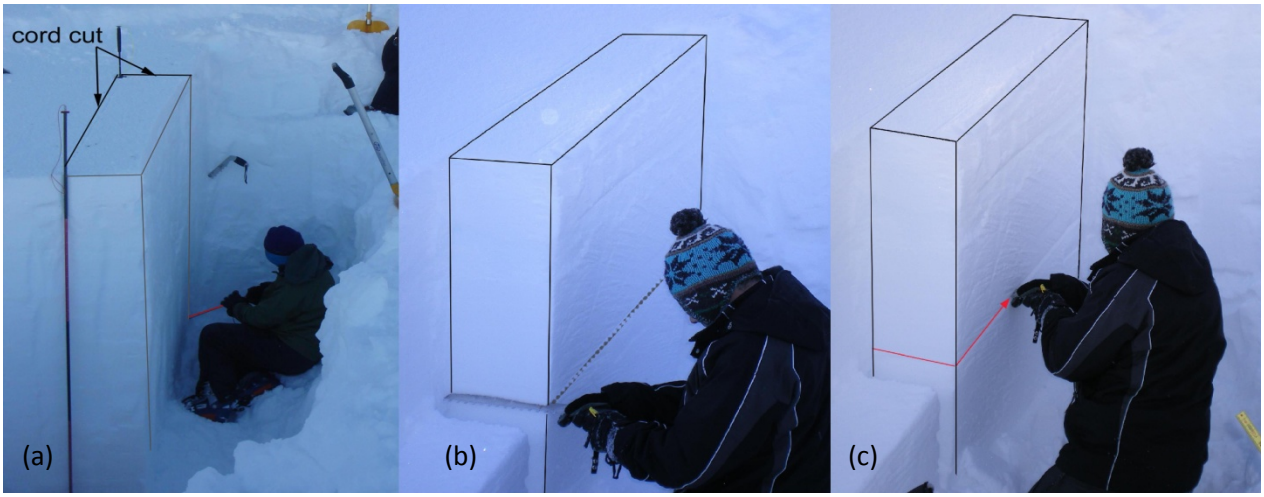
Many persistent weak layers (PWLs) are obvious in the snowpack wall. For those that aren't, gently brushing the pit wall with a brush, glove, or crystal screen may help find the layer or a standard compression test or deep tap test beside the PST can identify the weak layer.

STEP 2: prepare the PST column

The PST involves a 30 cm cross-slope column with an upslope length of either 100 cm or equal to the weak layer depth if the layer is deeper than 100 cm. For weak layers shallower than 100 cm, the column is always 100 cm long. The column is isolated from the surrounding snowpack by digging out the front and one side wall and cord cutting the back and unexposed side wall using a probe in the back corner much like the Rutschblock test. Measuring the weak layer depth before digging or cord-cutting the side walls is advised to ensure the column will be long enough. Be sure to cord cut to a depth below the weak layer being tested. A second probe or a ruler can be useful while cord-cutting to ensure the cross slope dimension is 30cm for the full depth. For shallow weak layers it is possible to isolate the back and unexposed side wall with the saw provided it is longer than the layer's depth and care is taken to ensure the saw stays vertical while cutting. If the weak layer is not easily visible, brush the column wall with a glove or brush to gently mark the layer along the column.

STEP 3: saw-cutting the column

With the weak layer clearly visible to the operator, the blunt edge of the saw is drawn upslope along the weak layer until the fracture jumps ahead of the saw at which point the operator stops cutting and marks the point at which propagation began. The test must be repeated if the saw left the weak layer during cutting. (cont. on back)



The PST process: (a) isolating the column using probes and cord; (b) identifying the weak layer and preparing to cut; (c) saw-cutting the weak layer until the fracture propagates ahead of the saw.

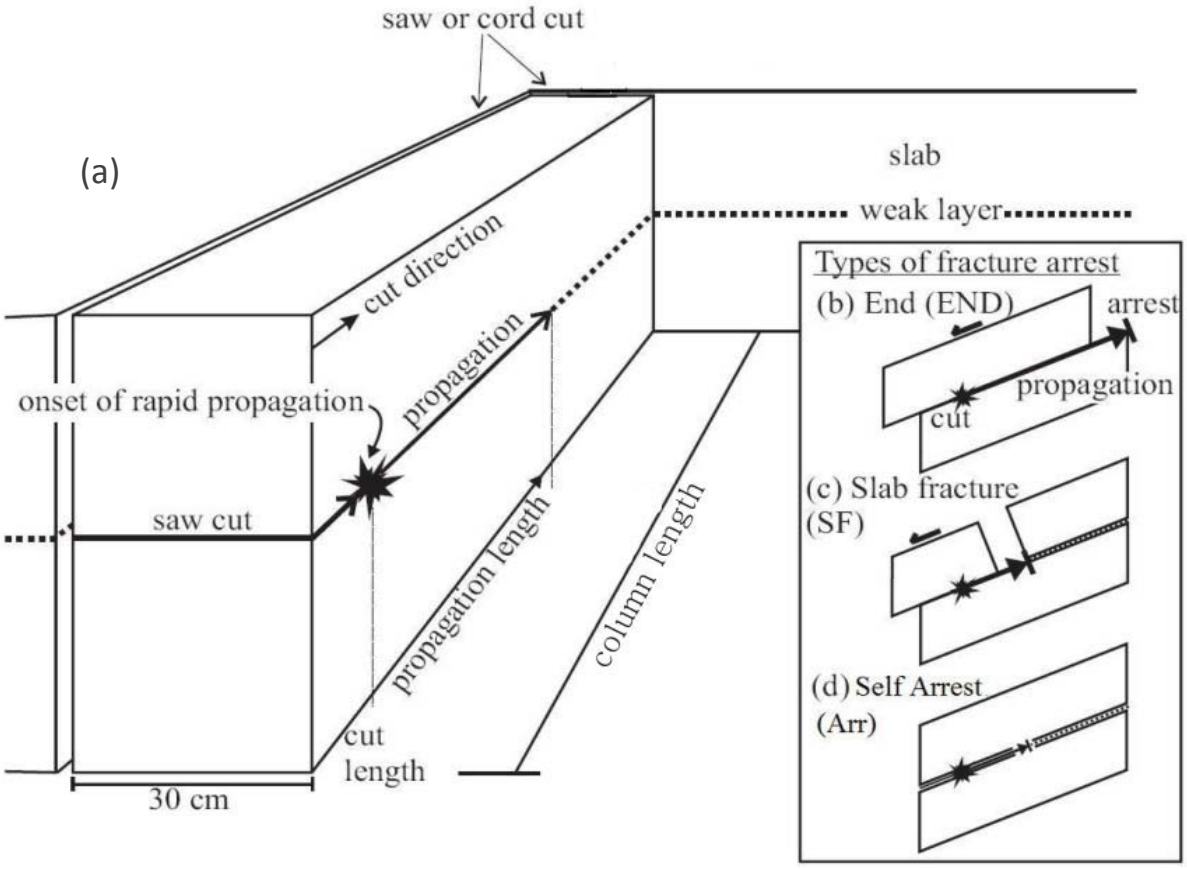
PST RESULTS: Three possible results can be observed in the PST with the onset of fracture propagation:

a) Propagation arrests somewhere within the weak layer before reaching the end of the column (Arr).
b) Propagation ends at a fracture through the overlying slab (SF).
c) Propagation continues uninterrupted to the end of the column (End).

To interpret the results, it can be said that propagation on nearby slopes is likely *only* when propagation starts when less than half the column length has been cut and reaches the end of the column (Gauthier and others, 2008). All other results indicate propagation is unlikely, including all results reaching the end when more than half the column was cut. A ruler is helpful in measuring cut length to compare to the isolated column length before interpreting the results.

The standard for recording PST results is **PST x/y (Arr, SF or End) down z on yymmdd** where x is cut length, y is column length, z is the weak layer depth, and yymmdd is the weak layer ID. For example: PST 34/100 (End) down 56cm on 080224 indicates high propagation propensity.

LIMITATIONS: The PST has been shown to indicate a larger number of false-stable results than other common stability tests particularly for shallow soft slabs (Gauthier and others, 2008). Additionally, pre-selecting and identifying a weak layer for testing may present an obstacle to inexperienced recreationalists attempting the PST in an unfamiliar snowpack. As with all snowpack tests, one test is rarely sufficient for an accurate stability evaluation, and the PST should be supplemented with a snow-profile, manual observations in the field, and other stability tests.



PST Schematic: The PST column is shown (a) with the three possible observable results of propagation to end (b), slab fracture (c), and self arrest (d)

Gauthier, D., C. Ross and B. Jamieson. 2008. *Validation of the Propagation Saw Test near whumpfs and avalanches***.** Proceedings of the 2008 International Snow Science Workshop in Whistler, BC, Canada, pp. 16-21.